SUPPLEMENT.

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Original Correspondence.

MARINE ENGINEERING ON THE CLYDE.

The rapid progress which marine engineering has made on the Clyde during the last quarter of a century is something astonishing. This industry has necessarily had to keep pace with the development of iron shipbuilding, with which it must go hand in hand. It is well known that during the period we have mentioned the Clyde has attained a foremost, if not the first, position in marine architecture. It would be very interesting to trace the various stages and vicissitudes through which shipbuilding and cognate industries have passed since the time that Mr. Robert Napier, head of the eminent shipbuilding and engineering firm of R. Napier and Sons, built the engines for the Leven, a steamer trading between Dumbarton and Glasgow in 1823. The engines for that vessel were of an exceedingly crude and imperfect kind, as compared with the compound engines of the present day, and the Clyde shipbuilders—especially the firm of Messrs. John Elder and Co., of Fairfield—have taken a most active part, if they have not been mainly instrumental, in bringing the industries in which they were engaged to the high point of perfection which they have now attained. Although compound engines, or rather the principle on which they were built, had long been applied to factories and other works of various kinds, shipowners were a long time in coming to recognise their merits, and hence it is only within recent years that they have been applied to marine purposes.

In overcoming the prejudice against compound engines, and proving their advantages over any other system for large vessels, Messrs. John Elder and Co. acted as pioneers; and with such success have their efforts been crowned that it is now a very rare thing to see any other kind of engine introduced into ships of ordinary size. The more extensive shipbuilding firms on the Clyde have works apart from their yards, for the construction of marine engines and boilers, but there are not a few who carry on the latter branch by itself. In this category falls to be included the works of Mr. David Rowan, which are situate in Elliot-street, on the north bank of the Clyde. Mr. Rowan is well known to local engineers, and to not a few on the other side of the border, as the President of the Institution of Engineers and Shipbuilders in Scotland—a society which numbers now something like 600 skilled and scientific men, and which includes among its members such names as those of Sir William Thompson and Prof. Macquorn Rankine. When the North of England Institute of Mining and Mechanical Engineers visited Glasgow in the summer of last year, and held a series of interesting meetings—which were fully reported in our columns at the time—conjointly with the Institute of Engineers and Shipbuilders in Scotland, Mr. Rowan's works were inspected, along with many others, and a high eulogium was passed upon the beautiful order and ingenious arrangements by which they were distinguished. It is only some four years since that Mr. Rowan acquired his present premises in Elliot-street, which were built according to his own plans and specifications. Being remarkably compact, and care having been taken to utilise every inch of space, the works do not cover a large area. On the left hand side of the entrance the machinery shed is situated. This is a large and handsome erection, and measures 110 ft. long by 95 ft. wide, and 45 ft. high to the top of walls. There is ample provision made for obtaining light from the roof. Two travelling-cranes, capable of lifting 20 and 30 tons respectively, traverse the building from one end to the other, and command the eastern door, while a third large crane, with a lift of 8 tons, is placed within convenient access of another door at the north side of the building. On the north side of the pillars by which the roof is supported in the centre two shops have been built above the ground floor, for pattern making and the smaller machinery. A short line of railway is used to bring the heavy forgings within reach of the travelling cranes. The machinery in the engine-shop is generally of a new and superior kind, the greater part of it having been selected and introduced within the last five years. One of the vertical slotting-machines, with a travel of 10 ft., and capable of slotting 10 ft. diameter, was first designed and made by Mr. Rowan, when he was manager of the extensive engineering works of Messrs. Caird and Co., Grennock. There are besides several slotting-machines of the ordinary kind, with various lengths of travel. The turning-lathes, of which there are many, varying in sizes, have all been fitted with steel spindles, and adapted to produce the finest and most particular work. The boring-mill is capable of boring cylinders 10 to 12 feet diameter, and of any ordinary length. Of drilling-machines there are many, some fixed and some radial, all of them being fitted with steel spindles. In regard to planing and shaping machines there are several, varying in size and length of travel. The bolt and screwing machines are also in all working parts made of steel; besides all the ordinary appliances required for carrying on this class of engineering. In the process of slotting links for valve motions, Mr. Rowan makes the machine perform its work with such perfect nicety and smoothness that the file does not require to be afterwards used, and this with links of any radius.

The whole of the machinery in this department is driven by a vertical engine of 50-horse power, 18-in. cylinder, and 2-ft. stroke. In the erection and application of this engine a rather ingenious plan has been pursued. To economise space as far as possible, the engine has been fitted into a brick wall, the other side of which forms the gable end of a spinning factory. The same engine is thus made to supply the motive power both to the factory and to the engineering works. Instead of the wheels and tooth gearing commonly used, the engine simply drives a shaft at the uniform rate of 100 revolutions per minute, and pulleys communicating with this shaft supply the various machines with their own rate of speed.

To the north-east of the machinery shop the blacksmith's forge is situated, and between the two buildings there are a number of water-closets and urinals, for the use of the workmen. It may be interesting in this connexion to remark that instead of allowing the excreta to find its way into the Clyde by a main sewer, as is usually done, provision is made for receiving it in a tank, from which it is carted away every morning by the Corporation. Instead of being allowed to defile the river, the sewage is thus applied to its legitimate purpose of manuring the earth. The municipal authorities have for many years been endeavouring to find a solution to the much-vexed question—"Which scheme of sewage utilisation is likely to be attended with the most beneficial and successful results?" Would not the condition of the Clyde, into which all the sewage of Glasgow is now permitted to enter, be rendered more tolerable if Mr. Rowan's system were more generally adopted? The smiths' shop is a building 100 ft. long by 45 ft. wide and 18 ft. to top of walls. A requirement too frequently neglected to be met in places of this kind is ventilation. The health of the workmen cannot be secured unless there is provision made for the escape of the sulphurous gases that arise from the fire, and the tendency of which, if unattended to, is to make them pale and nerveless. In this case, however, ventilation has been fully provided for by an open roof, through which air and light are admitted in ample measure to the workmen below. The fittings of this shop are of the usual kind, comprising a number of smiths' fires, cranes, and a steam-hammer, from Rigby's patent.

It only remains for us to describe the boiler-shed, which is separated from the smiths' shop by the entire breadth of the yard. Unlike either of the two buildings to which reference has been made, this shop is entirely open to the north, while it rises to the same height as the engine-building department, which it further resembles in respect of being provided with a glass roof. The measurement of the shed is 120 ft. long by 50 ft. wide. It is fitted up with punching and shearing machines, and other well-known appliances of the usual description, and the motive power is supplied by a vertical engine, built into a corner of the wall, in the manner already adverted to while describing the machinery shop. The boilers attached to these engines are of the usual two-flued Cornish kind, and have been fitted up in a remote corner of the yard, the steam being brought to the engines by pipes. A second forge, of smaller size, adjoins the boiler-shop. We may explain that Mr. Rowan undertakes the construction of marine engines and boilers for several of the most respectable shipbuilding firms on the Clyde, and at the present time he is rather busily employed.

BIRMINGHAM AND THE BLACK COUNTRY—No. VIII.

THE WORKS OF THE NEW BRITISH IRON COMPANY.

The Corngreaves Mills and Forges are in close proximity to the blast-furnaces we have described. There are four forges, the first containing a large helve and two sets of forge-rolls, driven by a condensing beam-engine, having a cylinder 43 in. in diameter. The two next forges, each containing a large helve and forge-train, are driven by a second condensing beam-engine, of the same size as the above. These forges are arranged one on each side of the engine. The fourth forge, consisting of a helve, &c., is driven by a separate engine, of smaller dimensions than the others. There are 40 puddling-furnaces, in which the iron is manipulated preparatory to being shingled and drawn out in the rolls to puddled bars. The first forge-engine also drives a 16-in. mill and a splitting-mill. In the former is rolled the larger iron, such as heavy rounds, flats, angles, and tees; and in the latter rods, from which nails are made. Connected to these forges and mills there are the necessary cutting down and cropping shears, and a Smith's patent steam-saw cuts the ends of the bars from the 16-in. mill. At right angles to the foregoing there are three mills—a plate-mill, with two pairs of rolls and a pair of blooming-rolls; a 10-in. mill, having three pairs of rolls; and an 8-in. mill, also having three pairs of rolls. These are all driven by a condensing beam-engine, having a cylinder 46 in. in diameter. Connected with the plate-mill there is a powerful pair of shears, worked by three cams, driven by a leather belt from the mill machinery. There are 17 heating-furnaces and one annealing-furnace to the mills. The boilers which furnish the engines with steam are all firing boilers. The fettling cinder, or bull-dog, for the forges is burnt in eight kilns, situated on the outskirts of the works. The rolls are turned in two powerful lathes, driven from a small beam-engine, which also works two pairs of scrap shears. Near the ironworks there is a commodious carpenters' shop, in which all the timber is prepared for the works and collieries. The machinery in this shop consists of a large circular-saw, supplied with a self-acting reversing sliding-table, upon which the large baulks of timber are cut up into planks, a smaller circular-saw, a wood-turning lathe, a vertical-saw, and a drilling-machine. These are all driven by an 18-in. cylinder high-pressure beam-engine, supplied with steam from two cylindrical boilers. The whole of the castings for the works are made in foundries situated near the blast-furnaces. The iron is melted in a cupola and two air-furnaces.

In the larger foundry there is a strong double wrought-iron crane, for lifting the ladles, moulding-boxes, &c. The repairs, and some of the engines, are made in the company's own fitting-shop, in which there is a moderately large planing-machine, three lathes, a shaping-machine, and one drilling-machine, all driven from a 14-inch cylinder horizontal engine. There are also blacksmiths' shops and chain-making shops. In the former is a small steam-hammer, and a furnace, and in fact, every convenience for making small forge uses. The red and fire-bricks employed in new erections, and for repairing the furnaces, are made in a yard near the ironworks. The fire-clay is gotten by the company from their own mines. For fire-brick making there is a 13-in. cylinder high-pressure beam-engine, working a grinding and a tempering machine, in which the clay is prepared, then taken away and moulded by hand into the required forms, and burnt in kilns. A small horizontal engine draws up and prepares the clay for the red bricks. Three small locomotives are engaged bringing coal and minerals from the collieries, and carrying materials about the works. Lines of railway, about 3-ft. gauge, are laid over the whole of the company's property; the Great Western Railway Company's line, joining Birmingham and Stourbridge, borders the works, and sidings from it run right into them; the canal also is not far distant, so that there is no difficulty as to the transit of material to and from the works to all parts of the kingdom.

The Nine Locks Ironworks, Brierley Hill, are the property of the New British Iron Company; they consist of three forges and three mills. The works are in rather a dilapidated condition, and the machinery, &c., is not nearly so good as at the Corngreaves Works; but the reason for this is that the pits have pulled them very much about, and it would be folly to spend capital in re-modelling them, as the coal is still being worked near to.

It will, perhaps, not be uninteresting here to say something of the mine from which the iron produced, not only at these works but at most others in South Staffordshire, is made. They use here, as we have before stated, the red and brown hematites, and the native ironstones. The red hematite is from the Ulverstone district, and is the anhydrous sesquioxide of iron. It contains from 85 to 95 per cent. of peroxide of iron, and from 60 to 70 per cent. of pure iron. The brown hematite, or hydrated sesquioxide of iron, is from Froghall, North Staffordshire. It is found in the lower coal measures, and yields of pure iron 37 per cent. and upwards. The quality of the iron made from it is superior, and the ore usually contains almost a sufficient amount of lime to flux itself. The native ironstones, or argillaceous iron ores, used principally here are the Gubbin found below the Thick coal, and the White stone lying immediately below the Heathen coal. Tho following analyses, as given by Dr. Percy, clearly show the composition of these measures:—

	Gubbin.	Whitestone.
Protoxide of iron	46·30	48·63
Sesquioxide of iron	—	—
Protoxide of manganese	1·44	1·29
Alumina	0·44	0·57
Lime	0·76	4·45
Magnesia	0·94	0·80
Potash	—	—
Silica	0·12	0·33
Carbonic acid	30·44	32·16
Phosphoric acid	0·74	0·31
Sulphuric acid	Trace	0·06
Bi-sulphide of iron	0·07	0·16
Water .. Hygroscopic	1·38	0·32
Water .. Combined		1·23
Organic matter	1·14	0·28
Ignited insoluble residue	15·26	9·40
Total	99·03	99·99
IGNITED INSOLUBLE RESIDUE.		
Silica	10·17	5·88
Alumina	4·36	3·07
Sesquioxide of iron	0·13	0·04
Lime	Trace	Traces
Magnesia	—	—
Potash	Undetermined	0·11
Total	14·66	9·10
Iron, total amount	36·14	37·45

We have now concluded the description of the works of the New British Iron Company; the collieries, including one of the best plants in South Staffordshire, we shall notice at some future time. We would put forward the works of this company, in some respects, as a pattern for the ironmasters of South Staffordshire, for they are laid out to the very best advantage. Although an old works, they have been so remodelled as to be equal to many of those recently erected: they are substantial, plain, and yet all that is required; there is no attempt at ornamentation, yet all seems neat and proportionate. Expense has not been spared to make the works what they are, and yet there seems to have been no lavish expenditure. Altogether they are a credit to the manager, Mr. Hunt.

In a former article we noticed the great importance to the community at large of Henry Cort's inventions in connection with the manufacture of iron. We showed that he introduced the main process upon which the whole make of wrought-iron depends; and yet for all this he died in poverty, never having received a farthing as royalty upon his inventions. He received from the Government, a few years before his death, a pension of 200*l.* per annum, made by several reductions to equal not much more than half that amount, to support himself and a family of twelve children.

No benefit whatever from the inventions has been received by his descendants, and an appeal is now being made in the metropolis on behalf of Mrs. Elizabeth Cort, widow of a son of Henry Cort. The matter, we are glad to hear, has been taken up with great spirit, and subscriptions are being forwarded to Mr. Charles Manby, of Great George-street, Westminster. We sincerely hope that the ironmasters of Staffordshire will not be behindhand in this matter, for they have benefited largely from Cort's labours. It is computed by Sir William Fairbairn that Cort's inventions have added the large amount of 600,000,000*l.* sterling to the wealth of the United Kingdom, and given employment to 600,000 working people throughout three generations. Sir I. K. Brunel, it is said, was strongly influenced by the misfortunes of Cort when he opposed the principle of the patent system. An opportunity is now offered for ironmasters to contribute some small portion of the gain resulting from the application of these inventions, and were everyone who has profited to give but little, a fair amount would be realised for one who would now, no doubt, have been wealthy had her father-in-law received what was due to him.

COLLIERIES IN NORTH DURHAM, THEIR WORKINGS AND MACHINERY—No. VIII.

The West Pelton, Beamish, and Tanfield Collieries.—Under this head are comprised ten collieries, under the ownership of Messrs. James Joicey and Co.—Handenhold, Alma, and Twizell Collieries, in West Pelton district; East Stanley, Air Pit, and Second Pit, in Beamish district; and Tanfield Moor, Tanfield Lea, South Tanfield, and East Tanfield Collieries, in Tanfield district. These collieries are situated in outlying districts, which were but thinly populated before the advent of public railways. The success which has attended this company's operations in coal mining has caused new villages to arise in proximity to their pits. The workmen's cottages are built with due regard to comfort and convenience; in this respect, and in appearance, they seem to be superior to most workmen's houses in this county. Some are built with two rooms on the ground floor, and two rooms above these; others with two rooms only, on the ground floor, suitably to the extent of accommodation required. The houses are in many cases supplied with water and gas. Such dwellings will, no doubt, be productive of advantage to the owners, by attaching steady workmen to their collieries. In all cases they have house and coal free of charge.

Most of the machinery erected at the collieries has been made at the works of Messrs. J. and G. Joicey and Co., Newcastle-on-Tyne. The engines are not of great power, though considerable quantities of water are raised by the pumping-engines; the large quantity is owing in a great measure to coal working being prosecuted at only moderate depths, and the percolation of water down to the workings is most likely to take place on the breaking of the strata. The boilers in connection with the engines are all of plain cylindrical form, uniform in size, 30 ft. by 6 ft.; they are not covered. The ventilation of the mines is in all cases effected by the agency of a heated upcast column and furnace. The pits situated in West Pelton and Beamish districts all produce gas coal from the Hutton seam. The Tanfield pits (which will be hereafter described) produce the coking quality of coal; the best is from seams found below the Hutton seam, which are

as yet untouched in West Pelton and Beamish properties. Many of these collieries have been worked on a small scale during a long period of years, and have been suspended, until their re-opening by the present company, who have now increased railway facilities and other conditions in their favour. The coal seams produce but little fire-damp, so that the underground operations are not trammelled with any precise form of conducting the workings, and of driving air-ways for the thorough ventilation of the mines, which is essential for fiery ones. At each of the gas coal collieries four screens are erected; these, with the heapstead and framing, are constructed of wood. There is also provided at each a shed, built with side walls of stone, containing from 2700 to 3000 tons of coal, which amount can be put to stock in a dull state of trade.

WEST PELTON DISTRICT.—The HANDENHOLD COLLIERY, after standing for 55 years, was re-opened in 1857 in the Hutton seam. The coal pit, also downcast, is 12 ft. in diameter, 65 fms. in depth to the Hutton seam. Special upcast, 20 yards from the former, 6 ft. in diameter. Lever winding-engine, 26-in. cylinder, 5-ft. stroke, 10-ft. cylindrical drum, and fly-wheel, supported at one side by wood framing. About 240 tons of coal raised per day, with single-tub cages. Two boilers supply steam at 30 lbs. pressure. Water is lifted at nights by this engine in self-acting tanks placed in the cages, one in each. The Hutton seam averages 3 ft. 8 in. in thickness. The air in circulation through the mine is 19,800 cubic feet per minute. The underground conveyance of coal is by one self-acting incline, eight horses, and fourteen small ponies. On the surface there are the usual workshops, saw-mills, granary, and corn crushing-mill, and gas-works. Gas is taken down the pit in 2-inch galvanised iron pipes by water, gas lights being used at the bottom of the pit. There is also apparatus for creosoting the timber and sleepers used on the main roads underground.

ALMA COLLIERY.—Commenced coal working in 1855. The coal pit, also downcast, is 65 fms. in depth to the Maudlin seam. Owing to faults—of which several of large size occur in this mine—the Hutton seam is afterwards reached on the same level. Winding lever-engine, has 22-in. cylinder, 6-ft. stroke, 10-ft. cylindrical drum; it raises about 400 tons of coal per day, with two-decked cages, two 8-cwt. tubs in each cage. Three boilers, steam at 28 lbs. pressure. The Hutton seam averages 3 ft. 2 in. in thickness here. The air in circulation through the mine is 33,750 cubic feet per minute. The upcast pit is situated one mile to west of the downcast. It is intended to fix a hauling-engine at the bottom of the upcast to haul between the coal pit and the extreme west workings, one mile further west of the upcast. At present coal is conveyed in the mine by two self-acting inclines, eight horses, and twenty-four small ponies. There are several syphons working successfully here in draining dip workings. The pump-shaft is about 100 yards distant from the coal pit. Beam pumping-engine, double-acting, non-condensing, 32-in. cylinder, 6-ft. stroke, valves worked by two air cataracts, and four weigh-bars. Water is raised in two lifts from the depth of 60 fms.; lower lift in the pit, 40 fms., 12-in. bucket, 6-ft. stroke; upper lift, in a staple at the back of house, 20 fms., 12-in. bucket; the beam extends over the cylinder to the staple-rods, giving the latter a stroke of 7 ft. This engine makes five strokes per minute, day and night, and can perform sixteen strokes per minute, if required. Calculating on five strokes per minute, and 29 gallons at each stroke, 208,800 gallons = 932 tons of water will be lifted in 24 hours. Three boilers supply steam at 25 lbs. pressure.

TWIZELL COLLIERY.—Re-opened in 1844. One coal pit, also downcast, is 10½ ft. in diameter, 65 fms. in depth to the Hutton seam. The pump-shaft near the former, also the upcast, is 6 ft. in diameter. Lever winding-engine, 21½-in. cylinder, 6-ft. stroke, 11-ft. cylindrical drum, wood framing, and house. About 350 tons of coal is raised per day in single-tub cages. The pumping-engine (of the same type as that at Alma shaft) has a 33-in. cylinder, 6-ft. stroke; it raises water in two lifts from the depth of 65 fathoms. The lower lift in the coal pit is 33 fms., 12-in. bucket, 6-ft. stroke; the upper lift in the upcast is 32 fms., 12-in. bucket, 7-ft. stroke; this engine goes three strokes per minute for four hours each night. Three boilers supply both engines at 28 lbs. pressure. The boiler feeder, with 7-in. inverted cylinder, 3½-in. ram, 12-in. stroke, forces water raised from the mine to the reservoir on a hill about half a mile distant, from whence a supply by pressure is obtained for Handenhold and the neighbouring villages; the supply will be available in case of fire at either of the three collieries. A larger engine is intended to be erected for this purpose. The Hutton seam varies from 3 ft. 6 in. to 3 ft. 8 in. in thickness of clean coal; blue metal roof, good; inferior fire-clay under the coal. The dip of the strata is about 1 in. per yard eastward; the cleavage runs nearly north and south. Coal is worked altogether on the bord and pillar sytem; the pillars are made 33 by 22 yards; bords, 4 yards; walls, 2 yards in width; these bords are driven to the dip as well as to the rise of the winning headways. The pillars are allowed to stand until that portion of them to the dip can be first worked, the working of them is then continued to the rise; there is then less difficulty with water than if the contrary course were pursued. No lamps are used, and but little powder. The hauling engine placed in the Hutton seam, 250 yards west from the pit, is a portable combined engine and boiler, with two 13-in. cylinders, 16-in. stroke, wheels in ratio of 1 to 3; two 5-ft. drums on one shaft with clutch between for main and tail ropes. The smoke and steam are conveyed through a brick flue in a portion of the air-course to the upcast. This engine hauls between the pit and a point near the engine, where the road diverges to three ways. No. 1 way going south is 1200 yards from the shaft to the return clip-wheel; it dips considerably; 25 tubs are run in each set. The clip-wheel, placed vertically, is 5 ft. in diameter; it gives motion to a 6-in. double-acting plunger-pump, 18-in. stroke, working from two wheels of equal size. The tail and main pipes are 5 in. diameter; the latter deliver near the junction of the three ways. The pump is in action while the engine is hauling to or from this way, and one night in each week besides. No. 2 way continues direct west, and is 2000 yards in from the pit at the return wheel. No. 3 way to the north is 150 yards in from the junction to the return wheel; beyond this horses are employed three-quarter mile further: 40 tubs are run in each set to Nos. 2 and 3 ways. The tail ropes are changed at the junction while the sets are at the shaft; a very simple kind of shackle is used. Main and tail ropes are used throughout these planes. A return sheave is fixed at the pit in this case. Coal is dropped down by a staple from a fault at the east side of the pit. Coal is also conveyed in the mine by 6 horses and 23 small ponies. The air in circulation through the mine is 18,000 cubic feet per minute. The produce of the three Pelton Collieries is conveyed by short private lines, which form junctions with the Stanhope and Tyne Railway.

THE BEAMISH DISTRICT.—Coal has been worked in this district over 90 years; the present owners have been in possession of the collieries about 20 years. The coal was formerly conveyed by horses on Beamish wagon-way to the Wear, at Fatfield; it is now conveyed by private line of about four miles, which forms a junction with the Stanhope and Tyne Railway.

EAST STANLEY COLLIERY.—One coal pit, also downcast, 92 fms. in depth to the Hutton seam; the upcast pit 10 yards distant. Lever winding-engine, 26-inch cylinder, 5-ft. stroke, 10-ft. cylindrical drum; about 560 tons of coal raised per day in two-decked cages, two 8-cwt. tubs in each cage. Water is lifted by the same engine three nights in each week, with self-acting wood tanks placed in the cages. A beam engine (formerly a winding-engine) is now used as a wagon hauling-engine from the bank head to a point above the screens, a distance of 100 yards; it has a 20-inch cylinder, 6-feet stroke, with 5-ft. drum on second motion. Four boilers supply both engines at 35 lbs. pressure. The coal in Beamish district averages 3 ft. 9 inches in the Hutton seam. The dip is eastward about 1 inch per yard. The coal is got always on the bord and pillar system, without the use of powder or of safety-lamps. The pillars are made 22 yards square, bords 4 yards, walls 2 yards in width. The conveyance of coal underground is by horses and small ponies, and one hauling-engine in the second pit.

THE AIR PIT.—One coal pit, also upcast for this and the second pit mines, is 84 fms. in depth to the Hutton seam. Lever condensing winding-engine, 30-inch cylinder, 6-ft. stroke, 10-ft. cylindrical drum; about 180 tons of coal raised per day in single-tub cages. A beam-engine, for hauling wagons near the pit, has 16-inch cylinder, 3-ft. stroke, on second motion, one 6-ft. drum. The railway engine at Pithill, condensing, has 32-in. cylinder, 6-ft. stroke, on second motion; it works a bank of 1 in 40, 1¼ mile in length, by one 6-ft. drum, and a plane on the other side, ¾ mile in length, with main and tail drums; two boilers, 20 lbs. pressure. The pump-shaft, in the valley, about 1200 yards distant from the air-pit, is 34 fms. in depth. Beam condensing pumping-engine has 28½-in. cylinder, 6-ft. stroke. This engine is similar in arrangement to those two before described, only it lifts at each end of beam the whole depth of the pit. At the outer end of beam a lift of 34 fms., 13-in. bucket, 6-ft. stroke; at the projecting end of beam a lift of 13 fms., 11-in. bucket, 7-ft. stroke. At this depth an engine of this form is thus capable of lifting a large quantity of water. It goes at present six strokes per minute, day and night. Two boilers 20 lbs. steam pressure. At 62 gallons per stroke, 535,680 gallons=2390 tons of water, will be lifted in 24 hours. This engine drains both the air pit and second pit workings.

The SECOND PIT opened in 1855. One coal pit, also downcast, is 64 fms. in depth to the Hutton seam. Lever winding-engine, 21-in. cylinder, 6-ft. stroke, 10-ft. cylindrical drum. About 300 tons of coal is raised per day in single-tub cages, 8-cwt. tub. A horizontal engine of 7-in. cylinder, 14-in. stroke, wheels in ratio of 1 to 4, and one 4-ft. drum, is used as a jack-engine, or for feeding boilers, or for pulling underground ropes. A hauling-engine, placed in the Hutton seam, 200 yards from the pit, has two 16-in. horizontal cylinders, 3½-ft. stroke, wheels in ratio of 1 to 2; two 4-ft. drums on one shaft, with clutch between, placed between the engines. Steam is brought from the surface boilers in 6-in. pipes; the escape steam is conveyed in 6½-in. pipes, both in the coal pit. Main and tail ropes are used for the main north road, 500 yards in from pit. Opposite the engine, 200 yards in from pit, the east road branches off to dip, ¾ mile in length, on which the main rope only is required.

At this establishment there are commodious workshops, also saw-mills, granary, and corn-crushing machine, bone-mill, and hoists. These are all worked with belts and shafting by a 12-in. horizontal engine, 2-ft. stroke, and Cornish boiler, 10 by 4 ft., 40-lbs. steam pressure. The creosoting apparatus comprises cylindrical tank for creosote, 30 by 6 ft., containing 600 cubic feet of timber each charge. Pressure is applied to the liquid by means of a 3-in. force-pump, driven by 6-in. steam cylinder, 6-in. stroke.

THE INSPECTOR OF MINES FOR SOUTH DURHAM.

SIR,—From two or three paragraphs which have lately appeared in the Journal I find there is much misapprehension existing as to the appointment of an Inspector of Mines for South Durham, and as to a reduction having been made in the salary appertaining to the office. Permit me to make a few remarks relative to this.

The salaries of all civil servants are at stated periods increased; and, consequently, the late esteemed Inspector, from his long service, had reached a high point in the scale of salaries paid to Inspectors; but at the same time, this could not be any argument to induce the Home Office to pay a *new* man at the same rate as one who had been 15 years or upwards in the service, therefore the gentleman recently appointed will have the same amount of remuneration that all the Inspectors have commenced with, except the first four appointed, who began with lower pay.

Your regular correspondent for the North of England, in last week's Journal, would seem to imply that the newly-appointed Inspector must be a man of second-rate ability. Not a word need be said on this, as it is well known that such is not the fact; indeed, the universal surprise seems to be that he should have accepted the appointment, as it is well known that from the appointments he held he must have been in receipt of a larger income than he can be as Inspector. I trust this will set your readers right as to the amount of pay, &c.

Ferry Hill, Feb. 8. COLLIERY OWNER.

RATING OF COAL MINES IN STAFFORDSHIRE.

SIR,—During the past year I have read many valuable letters in the Journal on this subject, in which some of your correspondents have brought before the public statements of a startling character, and which as yet have not been contradicted, thus leaving us to believe all they have stated.

I fear our Government has but a very imperfect account of the quantity of coal raised in this kingdom, as it is said to be well known that few colliery owners consider themselves bound by honour, or honesty, or law to return the full amount of coal they raise to the taxing master; and in that case the returns obtained by the Government from the clerks of parishes, unions, &c., are only calculated to lead to false deductions.

The rating of colliery property has hitherto been so little understood by those in authority that the colliery owners in Kingswinford parish (which forms the half, or more than half, of the Stourbridge union, and has been for the last century one of our finest coal fields, working one bed of coal, 30 feet thick), it is said, have been for a very considerable period in the habit of rating themselves; and so generous were they to themselves, that they had in some good form contrived to pay their rates on a very nominal sum. It is said the rent to be rated on the whole collieries of the parish had sunk under their conduct to little more than 4000*l.* per annum, worth, it is estimated, 100,000*l.* per annum. At this period the rates in the parish had increased 100 per cent.—from 10*d.* to 1*s.* 8*d.* in 1*l.*—which led to a general outcry, and some of the best informed on these subjects, who were not interested in the coal trade, soon formed themselves into a committee, for the purpose of obtaining fair and equal rating to all. And during the many debates between the coalmasters and the committee it was stated in open meeting, and published in the local papers, that it was estimated that more than 100,000*l.* had been paid by the poor, the traders, the farmers, and gentry in poor rates alone, which ought and would have been paid by the coalmasters during the last 20 years, if the mines had been rated according to law. I am also informed that when this committee laid the facts before the guardians and assessment committee, they expressed astonishment, and said they knew nothing of it, that they had always thought the coal mines had been properly rated. This declaration was considered by many as equal to an admission of their unfitness for the office they held.

During the 20 years alluded to our Government had published its Blue Books, and, with other matters, in the quantity of coal raised per annum in the country the writer would much like to see the amounts returned for the Kingswinford parish, which is the place where the ratable value of coal mines had fallen to so low a point. It is also possible that the like has been more or less the custom elsewhere, and if so I ask, in the name of all that is good, of what worth Blue Books or Government returns can be as data for calculations? Of course, the Government can only publish such information as it receives.

It is further stated that a landlord of a small property in the Black Country, a volunteer witness before a select committee of the House of Commons on rating mines, told the committee that it was wrong to rate coal mines on the rent they paid: he said if a colliery pays 1000*l.* per annum for rent, and a poor rate is made at 1*s.* in 1*l.*, the tenant will have to pay 50*l.* for poor rate. He considered that the rate ought to be made on the rental of the 1000*l.*, supposing it to be invested at 3 per cent., which would give a rate of 30*s.* in place of 50*l.* It must be remembered that this man was a volunteer to give evidence for himself; and it is also said that he was one of the self-elected worthies who had known so well how to rate their own mines. I have only given this as a proof of the justice of the outcry in all the Black Country to the various branches of Government for help.

The owner of mines, as the law now stands, receives his tens of thousands, and pays no poor or other rates. It is natural to ask what benefit will it be to the landlords of the mines to alter the system of rating as proposed by the witness above referred to? The only answer is that it would enable them to exact higher terms in rents, royalties, &c, from their tenants. No doubt the committee saw through the selfishness of the volunteer witness, and did not advise the House to adopt his proposition. Perhaps the following few lines will not be considered foreign to my letter—

"Just before the unfortunate declaration of war by France against Germany the common-place question heard in commercial circles was—'How is it that Belgium, France, &c., can purchase our pig-iron, take it home, and convert it into every description of articles, from rails to nails, and sell them in our markets at less price than we can get them from our own manufacturers?'"

The answer we have obtained to this question is that all mines on the Continent belong to the respective Governments, and whenever a capitalist becomes an employer of labour he can have the requisite quantity of the unlet mines to carry out his intended enterprise free of rent, royalty, &c., and this enables him too frequently to come to this market as our rival.

"In Belgium the ironmaster may say
I have no fear that landlord
Will some day distrain.
Such thoughts disturb not
My heart or brain.
I employ the poor, and by so doing
Add to my king and country power and content."

As long as men allow their wants to grow in proportion to their income (or faster, as is too frequently the case), we shall find the men with the greatest amount of income poor and hard pressed; and hence it is that whenever a man goes forward as a volunteer witness in matters of taxation, in which he is so much interested, it becomes the duty of the committee, or others, hearing him to receive such evidence as *ex parte*, and requiring confirmation from others.

The attention of the Poor Law Board cannot be directed to a more noble purpose than that of establishing a law which will render the poor rate question clear, making rent and income from all money lent at home or abroad, or otherwise, of every description contribute its quota towards the maintenance of that great institution.

Birmingham, Feb. 8. A WATCHMAN.

THE EDUCATION OF THE MINING ENGINEER.

SIR,—The subject is one of too great importance to be passed over carelessly or huriedly, for it is quite certain that every year will develope a condition of our coal mines which must entail upon the mining engineer new anxieties, requiring all the knowledge which theory, combined with practice, can afford. It is as absurd to advocate a purely practical training for such a profession as one which is entirely theoretical; and there is no doubt that before the student can be introduced as fit to take charge of working collieries, he ought to have had large experience of both. Will any mining engineer confess that his profession is one so purely mechanical that the reflective faculties are not brought into play, but that all problems can be solved by the "rule of thumb?" No; the great works which have been accomplished by some members of the profession are standing monuments, pointing to a very different source of power. Now, there are certain studies which are applicable to a training for any particular profession; and one would as much expect a young man training for the church to be untaught in divinity as that a student training for the profession of mining engineer should be without at least an elementary knowledge of the sciences treating of those minerals and strata which, in after life, it is to be his great object to bring to the surface at the least possible cost. Now, this latter part of my observation will be keenly appreciated by some as being the gist of the whole matter, believing, as they do, that no knowledge is requisite of how or why the phenomena of the earth's strata are brought about, his only duty being to get those that are valuable at the least possible cost. They will concede "that the engineer should be familiar with the strata and minerals in which his practice lies." This is always well, but how are you to teach a young man the nature and construction of a coal field without teaching him almost the whole of elementary geology? You must at least tell him what formations have their place above and what below the carboniferous zone; how to identify those formations; their distribution over the surface of this island; the nature of the fossil remains, and their relation to those embedded in other formations; the nature of faults, whether caused by denudation, dislocation, or intrusions of volcanic material, &c.; the characteristics of the base and overlying formations; so that by the time he has a fair knowledge of the coal deposits of Great Britain he will have gleaned all that is required in the way of elementary geology. The mineralogy of a coal field is a study of a less comprehensive nature; no one, however, will deny that he ought to have much of that training which is usually given to a civil engineer. Now, the fact is there is no royal way to knowledge. The student cannot take a bit here and a bit there, and then suppose himself master of those particular subjects. The only way, and in fact the shortest, to ensure a sound knowledge is to make himself in the first place master of the elements of his subject. You may as well take up one of the books of Euclid, and decide upon a study of it as being more applicable to some particular matter you have in hand, and at the same time leave the definitions, axioms, and postulates unmastered. If such a course of study is sufficient for the mining engineer, what is to save us from the childish mistakes which have been made in trials for coal in such formations as the Lias and Silurian? Why should we quibble for one moment as to the necessity of training the mining engineer in geology and mineralogy, when every young man now-a-days, who has had a liberal education, is taught the elements of such a science—for the latter is but a branch of the former?

The charge of ignorance upon such subjects if made against the profession, is certainly not nowadays tenable, because so many evidences of their success speak to the contrary. But the leading men of the profession are not men whose knowledge is simply confined to a knowledge of "the strata and minerals" in which their practice lies. There are some of our coal fields so far advanced towards exhaustion that the mining engineers of those districts must be very shortly called upon to deal with problems which no practical training only in the adjoining and exposed coal measures will enable them to solve. I do not for one moment underrate the value of practical experience, but I say that any man well furnished with the elements of the sciences which apply to his calling will make much better use of his opportunities of practically applying them than one who, while enjoying practical instruction, is without those rudiments. And there is in addition the great danger, should the teacher be only a man of practice, that he will take hold of many errors which have been handed down from a time anterior to the dawn of geological science.

It is very true that there are varieties of engineers whose training is applicable to the particular branch in which they exercise themselves. Speaking here of colliery engineers, I would remind the reader that he is not only called upon to erect plant in a colliery of a known coal field—to arrange for the draining, ventilation, cheap haulage, and the safety of the men, but he is also consulted as to the probable extension of the coal measures, and the probable depth to them in contiguous localities. He is invited to express an opinion on the probabilities of coal being found in distant places. How can he possibly judge of such things without some knowledge of the science affecting them?

If the mining engineer is contented to know how to sink a shaft, pump the water, ventilate and dial the mine, construct inclines, and other contrivances connected with the haulage of its produce all well and good, let him profess that only; but to do that he should be a fair civil engineer. He will, however, be liable to bewildement on meeting with puzzling geological freaks, even in the known coal measures, which if he has the slightest spirit of enquiry will lead him to look into that science, and without which his employer may be called upon to pay for many a useless yard of gate-roading. There let his profession end, for his opinion upon any subject involving a knowledge of geological science must be utterly worthless, if it be admitted that he is not by his profession called upon to make himself master of that science. I am far from believing that the leading men of this body, or I may say the majority, wish to place their profession in this degraded position. So far, indeed, are they from wishing anything of the kind, that they are forming themselves into institutes for the purpose of encouraging all kinds of scientific acquirement pertaining to their calling. A step most praiseworthy, and showing that they mean to advance the standard of their profession with the progress of science. That progress has indeed been so rapid, that many an engineer who is now not far past middle life entered upon his career without a thought of such a training in science; and as it is not very agreeable to admit one's deficiencies, or to take up at such an age the elements of a study which in a practical way he has to some extent grounded himself in, so it happens that we still have some who will battle for the old state of things; while taking care that their sons at least shall not labour under the same disadvantages, they send them where they may acquire what the parent never had the chance of learning.

The writer of an article in the *Mining Journal*, dated Feb. 4, on this subject says—

"The extent and limits of every coal field in this kingdom have been ascertained by mining engineers; geologists, as such, are seldom or never called or consulted in such work."

Surely the staff of the Geological Survey have done *most* of this

work, and have produced one of the wonders of the age in the geological maps they have issued. Then, may it not be observed that the only comprehensive treatises upon the structure and correlation of the coal fields is the work of geologists?—Mr. Jukes's work on South Staffordshire, for instance, which is consulted by every mining engineer of intelligence in that district. It must not be forgotten that the geologist avails himself of the very evidence which presents itself to the mining engineer, whether it be the effect of faults or otherwise, the difference between the two observers is that the purely practical man limits his observation to the appearance in the headways or shafts. The geologist generalises, and from the nature of the cause can form pretty good ideas as to the extent of the effect.

I think we may conclude with saying that if the capitalist likes to fool away his money by taking the opinion of a non-geological professional as to sinking for mines in doubtful districts let him do so, but it is quite certain that no incapable, ignorant, or inexperienced person should be entrusted with the charge of working collieries where hundreds of lives may be jeopardised by so doing, and, therefore, in order to ascertain the qualifications of persons who start in the profession of directing such works some kind of examination is requisite, whether or not it include the geological element. After all has been done towards intellectual cultivation nothing will make up for steady perseverance, shrewd observance, and a natural genius for the employment, and if young men who have been trained in the sciences may occasionally break down, and prove worthless, it is no less than what happens in many other professions in which it is needful to obtain a diploma before they are qualified to practice; that diploma should always indicate that the student is not unaccustomed to the application of the information he has obtained.

DANIEL JONES, F.G.S.

THE METALS AND THEIR ORES—No. XVI.—GOLD.

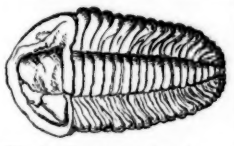
SIR,—Amongst other important gold-producing countries are the following:—Morocco, Siam, and Japan, the mines of Matasamia, in the latter empire, being justly celebrated for their productiveness. The islands of Borneo, Hayti, Madagascar, and the Philipine Islands are all auriferous, the metal being found in the latter in the river beds and detrital accumulations. In British Columbia gold is obtained from alluvial deposits and quartz veins. Vancouver's Island, Queensland, Tasmania, and New Zealand also return large quantities of gold. The gold exported from New Zealand in 1868 amounted to about 86,760 ozs., valued at 347,040*l.* In Australia gold was accidentally found in the year 1829, in the neighbourhood of the Blue Mountains, by Mr. Barwise, of Sydney, and Mr. James Ryan, whilst exploring for pasturage, but, strange to say, no further search for the metal appears to have then been made, and the subject was either thought to be of no consequence by the colonists, or it was forgotten, until some years afterwards the Rev. Mr. Clarke, Sydney, found gold in the Macquarrie river. But the real and conclusive discovery of Australian gold may be indirectly attributed to Sir R. Murchison and to geological science. This eminent geologist, in his address to the Geological Society, held at Penzance in 1844, expressed his conviction that gold would be found in the colony, being led to this belief from an examination of some geological specimens and sections from the Great Eastern Chain of Australia, which he compared favourably with similar formations composing the Ural Chain, a district he was intimately acquainted with. Sir Roderick's remarks afterwards appeared in the colonial journals, and Mr. Smith, who was engaged at the Berrima Ironworks, was, in 1849, encouraged by reading them to explore for gold. He succeeded in his object, and offered to disclose the locality to the Government of the colony for 500*l.* This offer was not accepted, but Mr. Smith was informed that he should be rewarded according to the merits of his discovery. They failed to come to terms, and in 1851 the discovery was re-made by Mr. Hargreaves, an experienced Californian digger, who found gold on the banks of Summer Hill Creek and Lewis Pond river, and he received a reward of 2000*l.* from the Government.

According to Mr. Jukes, a region over 1000 miles in length from north to south has been proved to be auriferous, the chief Australian gold localities being those of—

"Grafton Range and Barnet River, north of the Condamine; Stanley Creek and Canning Downs, in the Moreton Bay district; the neighbourhood of the Liverpool Plains; the Turon and Conobalas, on the Macquarrie, below Bathurst; the Abercrombie River, at the head of the Lachlan; some spots on each side of the Bredalbane Plains; the Braidwood and Araluen diggings, in the Shoalhaven district; Lake Elmeo, in the Australian Alps; and Ballarat, Mount Alexander, and Mount Blackwood, north-west of Port Phillip."

In the latter district of Victoria the divisions of Ballarat, Buninyong, Creswick, Sandhurst, and Gippsland are important gold mining localities. The rock formations of the Australian gold regions just enumerated consist mainly of granite and metamorphic, or transformed, rocks and slates, such as clay slate, chlorite slate, mica schist, and gneiss, being hard crystalline rocks, devoid of fossils, and often traversed by large veins of quartz. The most congenial rocks for gold in most countries, when taken in connection with granite, are the newest Tertiary drifts, the Silurian or Palæozoic, and the metamorphic non-fossiliferous rocks beneath them, especially if near their junction with eruptive rocks.

The word "Palæozoic" means to be "characterised by ancient animals," and the fossil remains of an extinct fish called the Trilobite, from its three-lobed-like form, is perhaps, the most characteristic and abundant fossil found in connection with those rocks which are associated with gold.



Silurian Fossil—the Trilobite.

The Secondary rocks, which include all the strata from the chalk down to the New Red Sandstone are not favourable for gold, neither are the older Tertiaries. In my next communication to the Journal I shall resume this subject.

E. GLEDHILL.

Mining Offices, Shrewsbury, Feb. 7.

STEAM ORE STAMPER.

SIR,—I have only just seen the letter in the *Mining Journal* of Jan. 28, signed W. Synnock, relative to our new ore-crusher. This seems to be the same person who, under the name of *Sinnock*, some time ago, submitted an invention to us, with large assurances of what he could do in introducing the new ore-crusher and obtaining orders. As the best means of disposing of Mr. Synnock's pretensions, I append a copy of the provisional specification he refers to as embodying the invention he claims to have matured; and with a view of showing the character of the whole affair, I may state that, previous to the publication of Mr. "Synnock's" letter in the Journal, I received letters from W. "Sinnock," addressed from No. 1, Scott's-yard, Cannon-street, London, in which he threatens to annoy us by writing to the public prints about our crusher, but at the same time intimates his willingness to come to an arrangement. We took no notice whatever of his letters, hence his communication to you.

As Mr. Sinnock has alluded to correspondence having passed between us which he asserts will prove his statements, I beg to state the following facts:—A Mr. Sinnock, of Mostyn-road, Bow, wrote to me in November, 1869, for prices of steam-hammers, which he wanted *for a purpose*, but what his object was he kept a mystery to the last. Mr. Chatwood and I were at that time working out our ore-crusher plans; but it seems that on Dec. 29, 1869, Capt. Polglase, of Goonbarrow, and Mr. Sinnock, joined in the patent under which Mr. Synnock claims. On Jan. 13, 1870, we met Capt. Polglase and Mr. Sinnock by appointment in Bodmin, and then only was the mystery solved; and they submitted their wonderful plans to us, and showed us their specification, and we at the same time showed them the plans of our moving cylinder arrangement and details of our invention, *which we had ourselves worked out some time before*. The result was that their plans were rejected, as being in many points unmechanical and full of practical defects, and our own plans, worked out in our drawing office at Bolton, without any assistance whatever from Messrs. Sinnock and Polglase, were finally adopted. In the sketch they submitted to us the cylinder was fixed, and the piston-rod carried the stamp-head; but, as a very large surface was required in the stamp-head, the difficulty at once presented itself of getting the rod strong enough to stand the shock of a side blow.

There were besides several other fatal objections to their plans. Indeed, all their so-called inventions merely amounted to the bare suggestion of substituting a steam-hammer for an ordinary stamp; but even this had been attempted unsuccessfully by Isham Baggs long before the name of Sinnock became known to fame. In fact, their plans were merely a very lame reproduction of Baggs' plans; and his patent was consequently abandoned. We were at first to a certain extent imposed upon; and Mr. Sinnock, or Synnock, of "London," representing himself to be a responsible person, and giving us an order for 20 ore-crushers as a guarantee, we were induced to enter into an agreement with him. As, however, his plans were useless, his so-called patent invalid, his guarantee order proved worthless, so that agreement, as a matter of course, fell through, and we heard no more of him until his recent communication from No. 1, Scott's-yard, Cannon-street. These, Sir, are the facts of our connection with Mr. Sinnock, and show clearly the amount of honour that is his due.

I have only now to direct attention to the specification given below. The steam-cylinder is said to be adapted only as the stamp-head *lifter;* that is, steam is used only to *lift* the stamp-head, and the hammer is consequently only of the *single-acting* class. It is also evident that the concentration of force into one large stamp-head was not even contemplated. The reference to the "dead blow" is very amusing for its vagueness, and the sudden manner in which the conclusion is jumped at. After Mr. Sinnock had seen us, and had had our plans explained to him, he wanted to alter his provisional specification, and wrote numbers of letters on the subject, but all in vain, for after a very brief struggle for existence his great invention died from natural causes. Surely he might now let it rest in peace. As to the alleged invalidity of our patent, I can only say we shall be glad to have an opportunity of testing it.

Britannia Ironworks, Bolton, Feb. 8. J. STURGEON.

"We, William Sinnock, of Bow, in the county of Middlesex, engineer, and James Polglase, of Bodmin, in the county of Cornwall, mining engineer, do hereby declare the nature of the said invention for 'Improvements in Machinery for Crushing Ores' to be as follows:—This invention consists in certain improved arrangements and combinations of mechanical appliances for crushing and pulverising ores by means of the direct action of the motive-power employed upon the stamp-heads, thus dispensing with the necessity for a great deal of the machinery ordinarily used for such purposes, and thereby economising the cost of construction and maintenance, whilst at the same time power is gained by the absence of the friction inseparable from the employment of intermediate gear. These objects are effected by connecting each of the stamp-heads (which are of the ordinary kind) with a steam cylinder, and adapting it with its piston for the stamp-head lifter, so that any suitable length of stroke can be obtained, and any amount of percussive action employed in rapid succession, according to the amount of motive power which is applied. By means of these arrangements a 'dead' blow is obtained at every stroke of the stamp-heads, and the necessity for 'spalling' the ore is entirely avoided. The requisite valve gearing may be actuated in any suitable manner, as will be well understood by persons conversant with such mechanism. The use of steam as a motive power is preferred, but any other suitable motive power capable of being applied in a direct manner to the stamp-heads may be employed."

MINING IN BRAZIL—THE TAQUARIL GOLD MINE.

SIR,—I visited this mine in the early part of December last. The new stamps appear to work well, and are situated about 100 yards below the powerful pumping-wheel, which keeps in motion that long run of flat-rods, &c.; but the stamps at the time that I was there were supplied with rather coarse stuff, extracted from the sides and ends of old workings, somewhat above the bottom of old mine left by former proprietors; this cannot be expected to yield much riches. I was informed by the workmen there that they had then a great many tons of rich shoot stuff in reserve, which will be taken to the stamps at the latter part of the month or the beginning of January for pulverisation. By that time they expect the old bottom of the mine would be drained by the new engine-shaft, when they will then be able to supply the stamps with the rich shoot itself, and a great deal of boxwork taken out at the same time. By what I could find out by all hands at the mine, the bottom of the old workings is very rich; the latter, in fact, is talked about far and near by everybody.

Feb. 8. AN OLD BRAZILIAN.

MINING ON THE PACIFIC COAST.

SIR,—The mines on Lander Hill, Austin, Nevada, are situated at the foot of Mount Prometheus, and the mineral-bearing veins strike about west 15° to 30° north, magnetic bearing, and dip to the north. The veins are embedded in hard felspathic granite. In the Manhattan Company's mines I visited the Oregon shaft, and descended to the 170 ft. level, where I traversed a cross-cut running nearly east, 454 ft., cutting no less than six distinct veins of mineral, being principally ruby, stephanite, and antimonial silver. The average thickness of the lodes varies from 4 to 16 in., and producing throughout $250 worth per ton. The veins in this cross-cut, at a distance of 394 ft., open into a level originally cut by the Florida or New York and Austin Company, with the intention of seeking a vein in the Hill on the eastern side, but abandoned by them, and now owned by the Manhattan Company. Continuing the descent, I enter on the 340 ft. level, running east by north, to meet the vein that was lost by a fault in the incline from the surface (say) 221 feet, and which re-appears about 45 feet on the east of this level; from here I descend to the 511 ft. level, running west by north, west of the shaft 488 ft., and eastward 58 ft., where another fault is encountered, but upon cutting through it 64 feet, the vein re-appears, and continues to its present position, 156 ft. further on. Throughout a good course of ore has been met with, averaging 12 in. in thickness, and producing $180 worth per ton. From the beginning of the fault, at 58 ft., a cross-cut was made south-east 101 ft., where a lode of 15 in. is met with, striking east-south-east, and ore is still being cut in this direction; from a distance of 22 feet in the cross-cut it was run south in good ore (containing iodide of silver) 92 ft., then south-west 35 ft., in equal quality of ore. Here the vein becomes perfectly barren; and after shifting the course south-south-west for 100 ft., it meets the drift of the lower (Manhattan) shaft, running south-east by south a distance of 253 ft., all of which produces abundance of second-class ore, worth $100 per ton. Starting back to the junction of the south-south-west level, and running west, we have again the same vein continued, of the second quality, for 144 ft.; here there is another fault, forcing the vein due south 80 ft., where it is again met with, and continues its course west by north ½ north 235 ft.; then it inclines to the south, and is still bearing that way, but with a richer class of mineral (say) $300 worth per ton, and average thickness of vein of 10 in. To give an idea of the value of two of their levels in the Manhattan shaft, there was taken out, from Sept., 1868, to Dec., 1869, $250,000 worth of pure silver, after paying all expenses, which amounted to another $190,000. Water is struck in the 340 ft. level, but even at the deepest point at present it amounts to but a small matter. The average cost at this mine for the past year has been as follows:—For breasting in the levels 1770 tons of mineral, $28·35 per ton, by contract, and for milling $35 per ton. Where day labour was employed it cost for extraction and timbering $53·10 per ton, with labour at $4 a day per man, for 10 hours. The cost of sinking one shaft, including every class of labour, and timbering to the depth of 550 ft., was $36,842. In one level lately opened, near the surface, they have struck rich ruby ore, averaging $1000 per ton; and two other veins now being worked on tribute average $300 per ton.

Next to the Manhattan in position and importance is the Pacific Mining Company of London, originally the Lane and Fuller, united with the Buel North Star. This mine previous to its tranefer to its present proprietors yielded over $500,000 of silver; the depth of the shaft is about 550 ft., and it was in one level alone that the large mass of ore was taken out which induced the present purchase. I descended the shaft with the superintendent, Capt. Brown, to the lowest level at a depth of 550 ft. Starting from here it runs south for 200 ft., and another is put in for 300 ft., bearing W.N.W. This has been done since Capt. Brown took charge; here I find an immense amount of dead work in extremely hard granite, the object sought for being to cut the vein believed to exist in this direction; as yet no ore has been found. Ascending the shaft to the 400 ft. level, I find it bears west, and this was run by the old company for about 500 ft., and is now in about 1100 ft. It was when the first company was in here 350 ft. that they based their great calculations on there being $600,000 in view, being under the incline of the Buel North Star, and to which they had opened a communication; this strike of ore continued only for a short time, and produced in all under 100 tons. From this point the level was continued up to its present position to come again upon the lode, and at 200 ft. from the end of the workings fair mineral was extracted, and the indications bid fair to opening out upon a good run of ore. Everything appears to be conducted upon the most economical basis. It will, in my opinion, be absolutely necessary for them to erect a reduction works of their own, as they at present really give half their ore to the Manhattan mill, and everyone else also who is obliged to have their ore treated there of that particular class, as it consists almost entirely of sulphurets, stephanite, and iodides, thickly mixed with the baser ores of lead, zinc, and antimony. The Pacific Company are engaged in sinking a round shaft at the extremity of their ground between the Florida and Toiyabe Mines; it is down about 100 ft., and they are on a blank ledge in the fault, which is the same I apprehend that stopped the Savage Company, and whose mine up to that point was the richest in this part of the country, keeping an entire mill going, but then abandoned from ignorance. Now to proceed.

From this mine I come to the Florida, or New York and Austin, which ran an incline into the hill some 300 ft., and has produced considerable quantities of very rich ruby ores; but in consequence of lawsuits, and a lack of capital, it was leased to some parties who work only when it suits them, and then extract very first-class ruby ore. By the side of this are two others, the Isabel and Magnolia, also leased from the same causes as the first; but here the work has been pushed ahead as steadily as their means permitted. Both are inclines into the hill, and have taken out a large quantity of fine mineral, the Isabel in particular, having taken out over $60,000 worth of silver during the last few months, much of it producing $1500 to the ton. A large quantity of rich chlorides have been met with in most of the mines at a very shallow depth. In a line with these is the Toiyabe, owned by a Philadelphia company, but, like many more, suffering under the bane of incompetent and reckless managers, who were entirely unacquainted with mining, and in consequence thereof large sums have been wastefully squandered, and difficulties have incessantly arisen, first with one and then with another, causing the mine to be shut down several times. In this dilemma I found it when appointed to extricate it from the troubles by which it was surrounded. Upon taking the water out I descended to the first opening, made at a depth of 120 ft., when I discovered an exceedingly promising ledge of chlorides and ruby ore running north-west, and dipping to the north. From this several tons of excellent ore was taken, it having been leased, and only stopped when the mine was first shut down. Descending the 320 ft. level I found that it had been run on the vein for 253 feet, but producing very little ore, though having indications of a very promising nature, which led me to open upon it, and for a distance of 35 ft. I have laid bare a very rich course of sulphurets and stephanite, the thickness of vein averaging about 8 in. I pursued the level to 290 ft., where it is entering upon ore that bids fair to be very productive. This lode is that of the Savage, which was displaced. Two cross-cuts have been let out running into the hill, and we shall not have to go far before cutting the ledge of the 120 ft. level, and another traced from the surface. There are no less than seven distinct and parallel ledges running through this property, all of which have been proved exceedingly rich in ruby ore at their extremities. After having placed it in thorough working order I have closed it up, awaiting the action of the directors in regard to raising the necessary capital to continue the operations. There are all requisite machinery and buildings upon the ground, and it needs only capital to develope the richest mine on Lander Hill. The extent of ground owned by the company is very large. It is now free from any liability. A little above this is the Trojan, well situated, but, from a lack of the requisite capital, is at present at a standstill. Lower down there is a mine, or rather incline, being vigorously pushed into the hill, and producing an abundance of rich chlorides, averaging $700 worth to the ton. Many more mines commenced under very favourable auspices have, after erecting their machinery, all collapsed from a paucity of capital, and so remain, with the building and machinery going to ruin. How few have calculated before hand the cost required for carrying on mining operations to a successful issue. Notwithstanding all these disadvantages, the Manhatten mill sent down by Wells, Fargo, and Co., during the eight months of their working in 1870, 754 bars of silver bullion, weighing 60,215 lbs., of the value of $895,888, and last month their shipment was 6188 lbs., value $85,214.

During the first 27 days of December last there were shipped from Pallisado (U. P. Railroad) by Wells and Fargo 165 bars of silver bullion, valued at $229,273, and in the same time the Central Pacific Railway Company have shipped 2812 bars of base bullion to San Francisco, weighing 311,590 lbs., the larger portion belonging to the Eureka Consolidated Mining Company. Through the courtesy of Mr. Curtis, the manager, I examined very minutely their operations at the mill, and in particular the new Stetefeldt furnace, which is only an adaptation of the Freiburg furnace. With this, after so many favourable reports, I was very much disappointed. Guido Kustel, in his work on "Metallurgy," mentions as one of its chief merits that of reducing sulphurets of silver when allied with antimony, lead, and zinc, as being complete and instantaneous, when no other class of furnace is able to reduce them. From very close and constant observation I must emphatically draw issue with him. It is just this class of ore that it does not and cannot treat with the least degree of success. The ores from the Pacific and Toiyabe Mines have been worked there, and it is so utterly incapable of getting rid of the baser metals that they can only be treated in conjunction with other ores free from these impurities, in the proportion of 1 of the former to 3 of the latter. When the former has been sent from the stamps to the furnace alone it has had to be stopped until a proper mixture could be put in with it, hence the necessity of purchasing the ore instead of returning the bullion. The height of the furnace is not sufficient by 20 ft., for as the finely pulverised ore (duly mixed with salt) drops through the hopper into the fire, it is only heated for the space of three-quarters of a minute as it passes through the flame before it reaches the hearth, and time after time, as I have watched the charge drawn, is the odour of sulphur extremely pungent, and the flame rising from the ore as it is raked out quite blue, therefore not being properly desulphurised, it is quite certain that it can never be thoroughly chlorodised. Very different is it with that that passes in its passage downwards over the bridge, and escapes down the flue, as it has to ascend through another flame (fed by a third fire), and into a long chamber or reverbaratory furnace, where that which still escapes passes with the flame and sulphur, &c., up into the stack. When the ore is drawn from these flues it is perfectly roasted, but at the same time a very large waste escapes into the stack. This is visible on its lip, as well as on the roof and floors of the building. To prevent this two gas-pipes, perforated, have been placed in the last reverbaratory furnace across the entrance flue into the chimney, and steam is incessantly ejected on to the escaping ore. This, I maintain, is not sufficient. It requires a fan to give a contrary current of air to that going up the flue, which would then force the escape back on to the steam, and thus throw it down. To make that furnace complete I should suggest that it should have two sets of fires on each side, instead of only one as at present, at a distance of 20 ft. above one another, and then the ore as it passes through one flame and becomes heated and partly desulphurised, would complete its desulphurisation through the second fire ere it reaches the hearth, but even then I question whether the antimony, zinc, and lead could be wholly got rid of, for they are very refractory ores alone.

The mode of sampling is also very defective, passing along at stated periods under the series of the stamps, and the assay of the mill being held as infallible. I have known a difference of $100 a ton between that assay and that made from the same sample in San Francisco. One of the advantages claimed for the Stetefeldt furnace has been the great decrease in the cost of the reduction, from $35 to its actual cost $15, but nevertheless no reduction has ever been made to the miner, the mill still recovering $35 a ton, and returning only 80 per cent. of the silver upon their assay, and yet they claim to work it up to 95 per cent. So I leave your readers to judge of the enormous profits accruing to the mill. The expenses are so great that the ore has to be very closely sorted ere it leaves the mine, and $60 ore is thrown upon one side as useless to trouble with. Now, in Virginia City the average of the ores treated is much under that, and yet enormous profits accrue to the mine owners from their being able to get the ore treated cheaply. Here this mill has the monopoly, and has used every means to prevent the erection of other works. The mining community has long been looking to the Pa-

cific Company of London to establish another mill, and would liberally patronise it if erected, though it ought to be of a different class to the one now in existence here. They would very soon be repaid all their outlay, and reap handsome profits; besides, hundreds of mines in the neigbourhood would soon start into active existence again, could the miners be sure of getting their ores treated at a reasonable rate, and otherwise fairly dealt with. The Manhattan Company have just given notice that they will not pay in gold here any longer, but give checks on San Francisco, 600 miles off, for the value of the ore.

And here let me add a few words about the parties sent out from England to be the arbiters upon the future fate of the shareholders. In nine cases out of ten men are selected utterly unacquainted with the country, locale, or the practice of working gold or silver ores. The theory is that if they are capable of looking after the practical details of mining in England they are also the right parties to decide the question in these countries, as to whether the mines here will or will not warrant the outlay proposed. No fallacy can be greater; hence in by far the greatest number of instances the shareholders find themselves bitten when too late. Besides, the temptation is too gilded to prevent them incessantly falling into the meshes prepared for them by those interested in the sale. And when they take charge of properties here for the purpose of extracting the precious metals, they have to unlearn all they have before learnt, or, rather, I may say, begin again, and find that the merest tyros in mining here know more about the matter than they do. Nearly all the losses accruing to the English capitalists can be traced to this fact, and as long as their prejudices sway their better judgment, and thus employ parties totally incompetent, instead of those who have devoted their whole lives to the acquirement abroad of the knowledge necessary to give their decisions practical weight, and upon which reliance can be implicitly placed, so long will mining be considered a lottery and a gambling speculation, which produces wealth to a few and disaster to the many. Of course, I do not mean to imply that *all* are of this class; but I speak of the majority, and 20 years' experience in foreign countries enables me to speak with some certainty. Take only the last five years in these States, and see how many failures are attributable to this cause.

And, lastly, in closing, I would inform your readers that Utah, Brigham Young's territory, is beginning to make itself notorious for the rich discoveries that are daily made there of gold and silver. The winter season has for the present pretty much put a stop to prospecting, but the spring is expected to bring with it an unprecedented rush of miners from all parts, which will help in itself, more than all the coercion upon the part of the United States, to put down Mormonism. For some time past argentiferous galena has been sent from Utah to the East (Jersey City), by rail, for reduction, to the extent of about 1000 tons per month; but the recent discoveries are principally chlorides and rich sulphurets. Ten tons of these ores, shipped from a mine owned by one General Connor, yielded, after paying expenses of transportation and amalgamation, &c., over $600 per ton. Many extensive and unprecedentedly rich discoveries have been made just before the snow fell, which will not be made public until the season is more advanced for uncovering these hidden treasures. As I may be travelling that way soon, I shall possibly have an opportunity of giving your readers fuller information upon the subject.

Austin, Nevada, Jan. 2. ORO ET ARGENTUM.

THE PACIFIC COMPANY, AND ITS MANAGEMENT.

SIR,—Among the remarks adduced at the last meeting of the Pacific Company, as reported in your Journal, was that of Mr. Cope, who proposed the erection of a mill in the town of Austin, as a plan to save the company.

Mr. Cope must be well aware, if he has recently visited Austin, that the Manhattan Company, who have purchased the exclusive right to the use of the Stetefeldt furnace in the Austin mining district, have the only mill that is running there at present. It is claimed for this process that $12 (2*l.* 10s.) per ton is saved more than by the reverberatory process. The owners of the patent charge a royalty of $2 (8s.) per ton for each ton of ore treated by their process. The Manhattan Company, finding its treatment to be very successful, purchased the district right for $25,000 (5000*l.*)

In the opinion of the writer, this is the principal, though not the only, reason why there is no other mill in operation at Austin, and it is not very likely that another mill will be started until the right to use this, or some other equally good, process be obtained.

The people of Austin consider the Manhattan Company a monopoly, and charge that their returns are no greater than before the introduction of the furnace. The company retort (no pun is intended) that this is one way of companies excusing themselves from working unproductive mines. And, as evidence, they point to the fact of a number of mills having been removed from Austin to outside districts because there was not sufficient ore for them to crush.

Not that the writer of this thinks that there is no silver in Lander Hill; but the cost of working the small veins of this hill below the water level is so great, that it is only in exceptional cases that it pays—such cases as the Savage, for instance. The Pacific Tunnel Company are driving a tunnel from the foot of Lander Hill, which will cut almost every vein in the hill nearly at right angles. Draining the ledges, and allowing an adit through which to work them, this project takes rank in Nevada in tunnelling enterprises as second only to the Sutro Tunnel, on the Comstock lode. Reference is made to it simply to show that Lander Hill is considered worthy of a great enterprise, and that the people of Nevada have not as yet utterly despaired of its ultimate success. A NEVADA PIONEER.

THE BANK OF CALIFORNIA AS A MIDDLE MAN.

SIR,—In a recent article on Mining, the San Francisco *Alta California*, in commenting on the price and value of mines on the Pacific Slope, observed as follows:—

"It has been suggested that a 'Mining Protective Union' should be organised by the leading miners and capitalists of California, for the purpose of preventing the sale of bogus mines abroad, and for checking the swindlers who attempt to take advantage of foreign capitalists. It is possible that some such organisation might be framed to give advice on the projects submitted to it; but it would be no easy matter to get it into successful operation. If it were practicable it might render much service."

And who would form the Protective Union? The old Washoe operators, of course. Protect us from such protection! No one understands better than the Alta that such an organisation for protective purposes is simply absurd.

Other articles published in the San Francisco papers from time to time tell us that the only way to avoid being swindled is to buy only on the recommendation of a San Francisco mining engineer, one who is endorsed by some substantial house or bank. Now, what concern of this character is of more respectability than the Bank of California, which does exactly this sort of business, and which insidiously advertises itself in the above manner? As soon as it obtains possession of valuable property, the price of it is advanced tenfold, and it is thus a suitable investment for English capital. On the discovery of the White Pine region they sent an agent to see the owners of the Eberhardt, but they, knowing the real character of the bank, snubbed him unceremoniously.

The manner in which this California institution aids the national advancement of the Pacific Coast is shown in the recent rise in the price of quicksilver. From forty to ninety cents a pound is quite an elevation, and certainly makes a great difference in the expenses of mining, where such large quantities of it are in constant use. This rise is one of the grand financial operations of the Bank of California, in conjunction with the Rothschilds. The bank, by adroit management, has gotten control of the three principal quicksilver mines of California—the New Almaden, the New Idria, and the Reddington. The Rothschilds, I believe, have played the same game with the Almaden, in Spain, having controlled for some time back the Idria Mines, of Austria. These five are the most productive and the most important mines of cinnabar in the world. The sources of supply being so limited, it has been easily controlled. Immense fortunes are made by such combinations, but the mining interest suffers correspondingly. The demand for quicksilver is limited, but it is imperative. Gold and silver miners must have it, whatever the price may be, or they must stop mining. Capitalists, consequently, can put the price as high as it can possibly be borne.

The people of the State of Nevada, at the recent election for member of Congress, expressed their dislike in a most decided form for the candidate who receive the support of the bank. Had this candidate run independently of the bank influence he would undoubtedly have been elected; with it, he was beaten by a small majority. I adduce this fact to show that the bank does not restrict its operations to California.

There are valuable mines to be had at reasonable prices, and hundreds of men on the Pacific Coast have risen from mediocrity to wealth by prudent investments in mines. The Eureka Gold Mine, at Grass Valley, pays 60,000*l.* in annual dividends; five years ago it sold for 100,000*l.* The Eureka silver mine, in Nevada, pays 500*l.* net per day; in July last it sold for 45,000*l.* The list of productive properties might be much extended, but this will suffice for my purpose.

What I would have English capitalists to understand is that if they want a really valuable property *at a moderate price*, purchase independently of any San Francisco organisation, and you will save money. They buy to sell again. Why should you not deal directly with miners, instead of with jobbers? PACIFIC SLOPER.

THE EBERHARDT AND AURORA MINING COMPANY.

SIR,—The fluctuations in Eberhardt and Aurora Mines have been very severe during the last month—as severe as unjust—falling to the extent of 2*l.* 10s. in a few days. The telegram from Nevada in this morning's journals proves the mistake. For the month of January the small mill of ten stamps has realised a profit of $20,000, (say) 4500*l.* Therefore, at 15*l.* per share (300,000*l.* for the value of the mine) the small mill would pay 54,000*l.* a year as interest; but we now have the new American 60-stamp mill to add to our profits, which gives them *six times* 54,000*l.*=324,000*l.* plus 54,000*l.* Thus, without doubt, we have 378,000*l.* a year as profit. Now, 2000 tons of good ore is quite ready for the mill just erected, and as the lodes of silver have been tapped in several places, no fear *can* exist as to the *supply* of silver ore.

With five rich mines—the Ward Beecher, which cost the company but 10,000*l.*, is valued at 75,000*l.* or 80,000*l.* alone—what speculation equals the prospects of the Eberhardt at 15*l.* per share, (say) the last quotation? 378,000*l.* on 300,000*l.* is 126 per cent. This calculation is based on facts, without taking into consideration discoveries of richer ores. We all know that Eberhardt has been an Aladdin's cave, and it is proved by new discoveries (since the purchase) to be so as much as ever. Why, then, the late absurd depreciation? I trust this letter may be inserted in the *Mining Journal* in justice to a valuable property, not equalled in any mine worked with British capital as a company.

In conclusion, I may inform the public generally that 600,000*l.* is not considered by many competent judges to be beyond the mark for the yearly return of profits, the great American mill being believed to be equal to the task, especially with such an energetic and competent gentleman as the present manager. H. P. B.

Hammersmith, Feb. 7.

P.S.—I do not enter into the value of the assays of silver ore, as the public are already acquainted with the enormous mass of silver per ton, some of it being nearly *pure* silver. I take the dollar also as 4s. 6d., without reference to exchange.

THF GOLD FIELDS OF NOVA SCOTIA.

SIR,—The returns for the past year are yet incomplete, but, judging from those already received, the gold product of 1870 will exceed that of 1869 by nearly 2000 ozs., and there will also be a marked increase in the average per ton and per man.

These favourable results are partly owing to the more economical working of the older mines and some extraordinary yields from new and previously abandoned mines at Montague, Oldham, and Caribon.

In the first-named district the Albion Mine, owned by Messrs. Lawson Brothers, produced 2582 ozs. 16 dwts., from 447 tons 3 cwts., obtained with 7692 days' labour. In the second, the St. Andrew's Mine gave a steady average of 2 ozs. per ton, and the MacAlister Mine 106 ozs. 13 dwts., from 1 ton 10 cwts., or 71 ozs. 2 dwts. per ton, the highest yield yet obtained in the province. In the last-mentioned district the Touquoy Mine gave 132 ozs., from 31 tons of ore; and a recent handmortaring of 8 lbs. of quartz from the same lode yielded 5 ozs. of gold, or at the rate of 1250 ozs. per colonial ton. It is not, however, pretended that the same rate could be sustained in reducing a whole ton, but about ¼ cwt. of equally rich ore was taken down by the same blast, and gave 40*l.* worth of specimens. After the Albion, the Wellington Mine ranks next in productiveness, during the year 1870 having produced 2033 ozs., or since its first opening, in December, 1863, a total of 14,249 ozs., from 11,488 tons, as fair an argument as could be submitted of the profitable and permanent character of Nova Scotia gold mines, when energy and sufficient capital are devoted to their development.

Not having the wish to make invidious distinctions, the returns which have been received up to this date will be cited in their order, and comments left for another occasion. The districts are represented by small capital letters, the mines by Roman type; the first number, tons; the second, ounces; and the average width of the lodes, where known, is given in Italics.

MONTAGUE.—Lawson or Albion, 448—2583, *four to five inches;* Symonds or Montague, 293—644 (to end of September only), *four to five inches;* Sundries, 3—13, *not known.*

SHERBROOKE.—Wellington, 2504—2033, *eighteen inches;* Dominion, 3354—1322, *eighteen feet;* Palmerston, 1651—684, *eighteen to twenty feet;* Wentworth, 167—93 (two months), *two feet;* New York and Sherbrooke, 1331—1577, *eighteen inches;* Excelsior (Timothy Wright, Chicago), 358—155 (three months), *two feet;* Sundries, 1621—1121, *various widths.*

RENFREW.—Sundries, 2087—735, *various widths.*

UNIACKE.—Uniacke, 1448—437, *one foot, and various;* Queen's, 179—34, *various;* Montreal, 75—35, *various;* Sundry, 27—11, *various.*

TANGIER.—Strawberry Hill, 606—677, *two feet;* Burlington, 763—393, *various;* Humber, 530—289, *various;* Sundry, 77—67, *various.*

STORMONT, OR ISAAC'S HARBOR.—Archibald, 80—59 (eight months), *various;* Allan, 29—19 (six months); Gisborne, 1141—429, *reported as twenty-one feet.*

OLDHAM.—Sterling, 876—457 (seven months), *two to four feet;* St. Andrew's, 198—544, *six inches;* Sundries, 1098—817, *various.*

CARIBON.—Tonquoy, 355—329, *four inches, and various;* Hyde, 164—108, *five inches;* Bushing, 90—13, *various;* Jennings, 5—20, *four inches.*

WINE HARBOR.—Eldorado, 1511—629, *eight to twelve feet;* Gladstone, 597—148, *eight feet.*

WAVERLEY.—Sundry, 837—757, *six inches to two feet.*

YARMOUTH.—Yarmouth, 115—63, *one foot.*

LAWRENCETOWN.—Westminster, 91—11, *various widths.*

The total gold product for the whole province during 1870 may be estimated at 20,000 ozs., against 17,868 ozs. for the year preceding.

In a future letter it is proposed to explain the causes that operate adversely to the growth of an industry which, by ten years steady progress, has manifested its importance and vitality, and thereby its claims to the liberal recognition and support of British capitalists.

Halifax, N.S., Jan. 21. ACADIENSIS.

GOLD ORE FROM NOVA SCOTIA.

SIR,—I have just had an opportunity of inspecting a considerable number of very interesting specimens of gold ore from various mines in Nova Scotia, recently brought to this country by Mr. A. Heatherington, author of the excellent little work on the "Gold Fields of Nova Scotia." As usual, the gangue is white quartz, in which the gold runs in thin threads, and here and there in patches, chiefly between the fragmentary weathered portion of the lode and the compact quartz, but even penetrating into the latter, more or less, in every direction. This quartz is in immediate contact with green talcose schist, very similar in age and nature to that which accompanies the white quartz near Hellensburgh, on the Clyde, and other parts of our own "Alta" Scotia. This talc schist is of a dark leek-green colour, and the gold is also abundantly visible in it—a rather remarkable circumstance—as well as in the quartz.

I did not recognise any very well defined octahedral crystals, but the patches of gold, sometimes as large as peas, are of a very pure colour, which indicates the very small amount of alloy in it, and I believe it has been already placed beyond doubt that its value is superior to that of the Californian gold, in the ratio of 888 to 966, or thereabouts. In some of the larger specimens there is a notable amount of yellow and white pyrites, highly impregnated with gold, the latter in many instances peeping out through the pyrites in wide yellow flakes. From 4 lbs. troy of an average sample of the larger specimens the gold was smelted out in a very rough manner, and the yield was 5 ozs., or upwards of 10 per cent. In a few I noticed a dark-coloured mineral, which I have no doubt was tellurium, or one of its compounds; in others, fragments of cobalt and nickel ore, and a little silver-bearing galena, were seen.

When I stated in a letter to you a few weeks ago that the average yield of the gold mines of Nova Scotia worked since 1859 was about 1 oz. of gold to the ton, I should have stated that this is the working yield—*i.e.*, the amount actually got out of the ore on the large scale; the assay yield is, of course, much higher. This fact again reminds me that there is evidently a wide field open for improvement in the treatment of gold and silver ores in general. Cannot some of our practical metallurgists imagine some more profitable process than the antiquated amalgamation, in which the daily loss of mercury goes against the profit of the mines? In ores so pure and so rich as those of the Nova Scotia gold fields I feel convinced that the zinc or lead process could be easily adopted, and would prove a valuable substitute to that now in use. But, perhaps, there has been scarcely time yet to try it. Maybe some of your scientific readers could inform us as to the practical working of the zinc process, not long since described in your useful Journal.

In conclusion, let me remark that it is certainly surprising to find that such enormous sums of money can be demanded for the Californian gold setts, when here we have, on British territory, in Nova Scotia, several valuable properties yet to be disposed of upon terms so very much more reasonable, and with chances of success so fully borne out by an experience which now extends over a period of more than 10 years. I need scarcely inform you that I have no interest whatever in these undertakings, nor, indeed, in any other mines at home or abroad, save that which results from a long habit of observation, and an intense love of mineralogy.

Putney, Feb. 8. T. L. PHIPSON, Ph.D., F.C.S.,
Late of the University of Brussels, Professor of Chemistry.

MINING ACCOUNTS.

SIR,—The *Mining Journal* has constantly exposed the system of mining accounts which admits of a good credit balance being shown by keeping back two, and in some instances three, months' costs. It was by this means that the unfortunate shareholders in Wendron Consols, after receiving a few pounds per share in dividends, found themselves called upon for nearly 20*l.* per share to pay debts of which they knew nothing. And it is this pernicious system which is bringing universal disrepute on the cost-book manner of conducting mines. I would ask, then, and perhaps some of your legal correspondents can answer the question, is there no remedy against it? Can a shareholder in a cost-book mine obtain an injunction to prevent a dividend being declared in a mine when an investigation of the accounts shows it to be in debt? ENQUIRER.

MINING AS A LEGITIMATE INVESTMENT.

SIR,—In a series of letters which appeared in your columns I called the attention of your readers to legitimate mining, as holding forth inducements unequalled in any other branch of British industry. In a letter published in the *Mining Journal*, near the end of the disastrous year 1866, I made some remarks which, as they attracted the attention of many of your readers, and caused a considerable number of letters to be sent to me, I will, with your permission, quote, especially as the interval of more than four years has not altered the state of things then referred to, and the opinions then expressed:—

"It is not in actual investments in mining that money is lost, which makes so many timid of mining enterprise, but it is thrown away in share speculations, to the injury of mining, or, at least, the reputation of mining as a business. The fluctuations in the mining share market, notwithstanding the danger they create for those who meddle with them, have an attraction in their very nature for persons of a venturesome and speculative turn of mind. It is an excitement similar to that of a bet, and awakens hopes and feelings unknown to ordinary legitimate business ventures. Some men are drawn into the vortex of excitement thus ready to receive them, and are, of course, lost there. The excitement has a tendency not only to ruin the circumstances, but also to pervert the mind of those subjected to it. Men on the Stock Exchange and elsewhere agree to give a certain value to shares in which they have an interest, until the quotation is run up, when those very persons sell their shares, realise large sums at the public expense, and send down the nominal value of the shares themselves. The operations called 'bulling' and 'bearing' can assume no form that is honest, and which is not injurious to the property so treated. It is a remarkable fact that the lists of shareholders in mining property, compared with the original lists, show very little differdnce, either as to the names or the amount of interest held by each person in the property. It is obvious, therefore, that the vicissitudes in the quoted prices recorded daily have in such case resulted strictly from the illegitimate proceedings vulgarly designated as 'bulling' and 'bearing.'"

In the letter thus quoted I gave an instance of a Cornish copper mine in connection with which thousands of shares in a few months changed hands among the dealers, whereas in reality only 400 had been transferred. The mine is divided into 5636 shares, and yet in less than 18 months 40,000 shares were sold.

Since my communication to your columns in the December of 1866 mining properties have been much recommended on the Stock Exchange by the very persons who previously depreciated all property of the kind, but who now, having become promoters of companies to work mines, talk of them very much as an auctioneer "cries up" the commodities he is about to "knock down." A consequence of all this is that elements of an injurious nature are superinduced upon mining enterprise. I could select five companies for illustration of this remark, which unitedly represent a capital of 210,000*l.*; but the purchase money in the aggregate amounts to 171,000*l.*, leaving a working capital of only 39,500*l.* It is unnecessary for me to point out to intelligent mining agents, or experienced investors in mining property, the inevitable result.

However reluctant I may be to go minutely into verifications of my assertions, I can confidently refer to the Editor and many contributors of the *Mining Journal* as to their truth. Many of "the market schemes" from time to time before the public are entirely worthless, and not only so but ruinous to those who make heavy investments. It is important also to invoke the attention of your usual readers to the system pursued in working the mines of Cornwall. There is, so far as we at present know, no area of country upon the face of the globe so variously rich in metalliferous wealth as Cornwall. It is, therefore, of the utmost importance that the work done there be appropriate and adequate—I say of the uttermost importance, because metals and the proper way to procure them form the grand base of the pyramid of our commercial greatness. Richard Cobden once remarked that "metals and skilful work in metals consituted the foundation of national wealth." The words of the great political economist were not so credible when he in his far-sightedness employed them as they are now, when mining enterprise is reviving, and all nations are making haste to recognise its importance.

I cannot be wrong, then, in saying that the *modus operandi* in the development of mining property is a very serious matter for consideration.

Now, the first thing that ought to engage attention is "the take." Lords of the mining country are very blind to their own interests, and the interest of the public, who will not lease on reasonable terms. The fact that many of them do not do so is, unhappily, too well known to need proof here.

The next point is that whether the investors are united on the Limited Liability Principle, or mean to work on the old Cost-book System, so far as that now exists, it is absolutely necessary that the management be competent. Managing directors must not be chosen from accountants, merchants, novices, connoisseurs, and gentlemen, who have nothing else to do. They must known mines and mining, how to go about it, and how to do it.

In the working it should be remembered that depth pays. Adits should be driven commensurate with the nature of the enterprise, and levels opened, proper machinery put on the ground, and the work carried on with an amount of capital equivalent to its effectual accomplishment.

When from the low price of metals, or legal difficulties with the lords, a mine is abandoned, the law ought to step in and protect the works thus standing from decay; so that if another man or company of men resume the enterprise he may find no dilapidation. Instead

of having to sweep out the rubbish of the ruins, the next occupier should enter upon a wholesome and complete tenament, adapted to the work projected.

I cannot in a single letter, Mr. Editor, express all I have to say on these subjects. I shall, with your permission, return to them, and again, if not too great a trespasser, ask your indulgence, while I invite investors, and all concerned in mining, in your columns, to consider some facts and thoughts, which a long experience in mining has enabled me to consider and suggest. THOMAS SPARGO.

Gresham House, Old Broad-street, Feb. 8.

THE VAN MINE, AND ITS PROSPECTS.

SIR,—Why so little is heard, and, if possible, still less written, concerning this truly marvellous mine it is difficult to divine, unless it be that "to paint the lily" or to "gild refined gold" are artistic operations that had better be left undone. The only information supplied even to the shareholders is embodied in the monthly reports of the manager. Although these periodical documents contain facts far—very far—exceeding all possible anticipations, yet, being couched in purely technical language, they fail to convey to the minds of those unfamiliar with mining the almost incredulous manner in which the property—both as to extent and rapidity—is unfolding its treasure. It is true that our manager told us in the last report that "the mine is richer, and the reserves are greater, than ever;" and that, in face of the hindrances by frost and otherwise, the sampling for the month was the largest ever yet made, amounting to 430 tons. But who, at least among the public, know that this return is almost quadrupled as compared with the monthly return not much more than twelve months since—an unexampled result realised in the face of every drawback in respect of surface appliances and means of transit. It is not surprising that one so often hears from those unacquainted with the prospective producing capabilities of the mine that the current rate of dividend appears hardly to justify the present price of the shares; but how different would be their opinion if they were informed of the fact that it is more than probable the profits of 1871 may not be far short of 100,000*l.* The permanency of the mine is being largely augmented day by day—in fact, at the rate of ten times the amount of ore returned, and months have elapsed since the "reserves" were estimated by experienced authorities at not less than 2,000,000*l.* Who, even among the shareholders, imagines it likely that before this year shall have passed away Van will be probably returning something like 1000 tons of lead per month, while the profits must, of course, increase in a material ratio, by reason of the additional and economical facilities that are being constantly brought to bear, not the least of which is the railway just completed, expediting and economising the cost of transit of mineral from, and materials, stores, &c., to, the mine.

Although I strenuously deprecate anything like "puffing," I think, if only in justice to mining, the general public should be kept better informed as to the enormous value of such a mine as Van. Heaven knows that there is always "over-much vaunting" about certain properties, which, to say the least, require development before they can justly claim the name of mines, and why, as I have already said, the true merits of Van—which is a mine—are not more often and generally pointed out is an enigma not easily solved.

During 1870 Van returned a profit of 30,000*l.* against 12,000*l.* in 1869, equal to an increase in twelve months of 150 per cent., notwithstanding large and continuous deductions from its revenue, properly chargeable to capital; and if during 1871 the same rate of increase is maintained the profits will reach 75,000*l.*, equal to a dividend of 5*l.* per share, or over 9 per cent. upon the present price of the shares—not a bad return for a mine, notwithstanding its present revenue, that can scarcely be considered as yet more than what is known as a "progressive mine." Last year Minera exceeded Van in point of profits by not more than 4,000*l.*—Van, a young mine with its store-house of treasure scarcely opened, Minera a mine that has for many years yielded larger profits than any other lead mine in the United Kingdom.

I have written these few lines in justice to Van, and hope they will be followed by other communications from those who have substantial reasons for extolling its merits.—*Feb.* 8. A SHAREHOLDER.

ROMAN GRAVELS MINE.

SIR,—I have perused with much interest and satisfaction the exhaustive reports of Captain Williams, of Van, and Capt. Waters, of Tankerville. It is clear that the present monthly return of 100 tons of lead cannot be accepted as in any way indicating the actual producing capabilities of the mine when it shall have been placed in an effective working condition. Its actual resources are not yet known, nor can they be until those cardinal points referred to by these two authorities shall have been developed; knowing the characteristic caution both of Capts. Williams and Waters, the more especially when computing as to the future (as shown by the results now being realised both at the Van and Tankerville, when compared with those indicated in the original reports), I think we, as shareholders in Roman Gravels, may safely calculate upon the estimates being exceeded by at least 50 per cent. In this case the returns will during the next six months range somewhere about 150 tons per month, and at the end of that period the necessary additional operations will have been completed, and the returns brought up to 200 tons, and in twelve months to (say) 300 tons.

In this estimate I am merely carrying out the same ratio of the excess of the computed returns originally made by Capt. Waters with regard to Tankerville; and if I were to adopt the same basis in reference to Capt. Williams' original estimates as to the monthly produce from Van, I fear I should be thought to be over sanguine. But my chief purpose in troubling you, Sir, with this matter is to direct through your columns the attention of both Capt. Williams and Capt. Waters to the absence in either of their reports to any reference whatever either to the monthly cost or the price which the lead realises. It is not enough, I take it, for an ordinary shareholder to be told that he possesses a mine that will return 150, 200, or 300 tons of lead per month, when in ninety-nine cases out of a hundred the shareholder so informed will probably be neither aware that this is a large amount for a mine to return, nor its commercial value when returned, nor the cost of returning it. If it is not asking too much of these two eminent authorities, it would certainly be satisfactory to myself, as I doubt not it would also be to the whole of my fellow-shareholders, to have some definite information upon these material points.

It is not for me to make any comparison between one mine and another, nor would I desire to do so in any invidious manner; but I must confess my utter inability to understand the reason that Tankerville should be selling in the market at (say) 13*l.* per share, while Roman Gravels, in the same number of shares, does not at present command a market value of more than 10*l.*, the more especially when, even calculating only the returns as estimated by Capts. Williams and Waters, the difference in point of results between the two mines cannot exceed 50 tons per month for six months—an aggregate difference in money value (taking the lead at 12*l.* per ton) of about 3600*l.*, equal to 6*s.* per share, whereas the difference in market value is 36,000*l.*, or 3*l.* per share—in other words, three years' dividends, according to the rate now paid by Tankerville.

In these remarks, however, I wish it to be distinctly understood that I do not in any way wish to depreciate Tankerville to the benefit of Roman Gravels—on the contrary, if my interest is greater in one than the other it is in Tankerville; therefore, I am extremely unlikely to do anything to disparage it; but, as I have already said, my only reason in thus occupying your space is to elicit from Capts. Williams and Waters information upon the points above referred to.—*Feb.* 8. A SHAREHOLDER IN ROMAN GRAVELS.

REPERRY TIN MINE.

SIR,—Enclosed I beg to hand you the reports on the above mine, made on behalf of one of the shareholders. Will you kindly insert them in the *Mining Journal*, as I promised I would make them public. I also beg to state that the assays of all the different ends now at work give an average metallic tin produce of 10 per cent. I also have the pleasure of informing the shareholders that since the reports were made the mine has very considerably improved.

Feb. 9. G. H. POULTON.

Jan. 31.—The 25, on the north lode, is driven 14 fms. east of the engine-shaft, and we have only just reached the run of tin ground gone down in bottom of the 15, and the lode has very much improved during the last 8 or 10 ft. driving; at present it is about 1 ft. wide, producing good work for tin, and letting out a large stream of water, so that I am glad to say it is draining the winze above. The ground driven in this end in the past month is 5 fms. 1 ft. 2 in. The cross-cut in the 25 fm level, is driven 15 fms, south of the engine-shaft, and we consider that we shall have to drive a few fathoms further to intersect the south lode. This end is being driven by six men, who have explored during the last month 5 fms. 2 ft. 2 in. We have put four men to rise in back of the 25 to communicate with the winze gone down in bottom of the 15. We have also eight men stoping in bottom of the 15, on the tin ground, and the lode is producing some very good work for tin. We are pushing on every branch of the tin department so as to get a good batch for the next sale. The monthly cost is considerably reduced, and every point in operation is being prosecuted with the utmost vigour.—R. REYNOLDS.

Jan. 31.—The following is my report of the Reperry Tin Mine, Lanivet, which I have inspected this day:—In the 25 east the lode is about 1 ft. wide, producing good work for tin, with strong indications of a continuous improvement. In the 15 a winze has been sunk about 2 fms., with good work for tin in the bottom. On account of the pressure of water it was suspended, but since the improvement in the 25 a large stream of water has proceeded from the lode, and drained the winze above. Operations will be resumed here at once, and, from the appearance below, I consider a large quantity of profitable tinstuff can be raised. The stopes in bottom of the 15 are producing some very productive work for tin. I am pleased to inform you that since I inspected the mine, about a fortnight since, the stopes have greatly improved. The ground has become more mineralised in appearance, and, when the apparently almost inexhaustible mineral character of the district is considered, the probability of success assumes a higher position than would be in some other districts.—WM. BUCKTHOUGHT.

Feb. 2.—The north lode has greatly improved since last week; lode now 1 ft. wide, rich for tin. I beg to say that the tin ground in the 15 is dipping east, and the 25 end, east of engine-shaft, is now approaching the rich tin ground gone down from the 15. I find the water also is sinking in the winze, 4 fms. below the 15, thus indicating we are close on the run of tin ground. Nothing new in the cross-cut south, and, from dialling the lode at surface, I find we shall have to drive 4 or 5 fms. more before we intersect it. The stamps are in full operation, and the tin coming from them is very satisfactory.—T. PARKYN.

[For remainder of Original Correspondence see to-day's Journal.]

THE MINING JOURNAL.—Now ready, neatly bound, price 1*l.* 10*s.*, VOLUME XL., FOR THE YEAR 1870. To be had through any newsagent or bookseller; or from the MINING JOURNAL Office, 26, Fleet-street, E.C.

SOUTH WALES COAL AND METAL MARKETS.

At a meeting of the committee, held at the King's Head Hotel, Newport, on Feb. 1, present—Mr. G. H. BANKS (in the chair), Pontymister; Messrs. David Morris, Briton Ferry; J. W. Jones, Newport; Charles Conway, Pontnewydd; H. A. Swan, Cardiff; L. A. Homfray, Newport; S. G. Homfray, Swansea; Francis Nash, Coleford; and R. S. Roper, hon. sec.,

The Hon. Sec. reported that the committee now consisted of the following gentlemen:—

Messrs. Phillip Woodruff,	Messrs. George Strick,	Messrs. S. G. Homfray,
G. H. Banks,	J. W. Jones,	W. Thomas (Landore),
Charles Conway,	J. Mayberry,	Thomas Elford,
T. W. Booker,	David Morris,	Jas. Livingston,
D. Davies,	T. Chivers, jun.,	Lewis Davies,
J. J. Jenkins,	H. A. Swan,	L. A. Homfray,
E. F. Daniell,	Edward Finch,	P. S. Flower,
W. Forester,	James Clark,	R. S. Roper, hon.
A. B. Gullan,	Francis Nash,	secretary.
J. S. Tregoning,	J. Dowle Jones,	

He also reported that he had issued about 400 circulars to gentlemen likely to be interested in the markets. Those who had promised to support and attend the markets were as follows:—

William Adams, civil and mining engineer, Cardiff; Banks and Co., tin-plate manufacturers, Pontymister; James Banfield, coalmaster, Swansea; T. B. and W. B. Brain, coalmasters, Coleford; James Brogden, iron and coalmaster, Tondu Works; J. J. Bodmer, engineer, Newport; F. Barratt, jun., iron ore master, St. Austell; T. B. Batchelor, timber merchant, Newport; John Batchelor, shipbuilder, Cardiff; E. J. Beor, F.G.S., mining engineer, Swansea; Henry Burton, merchant, Newport; Wm. Burton, merchant, Cardiff; Samuel Batchelor, timber merchant, Newport; T. Foster Brown, engineer, Cardiff; T. W. Booker and Co.; ironmasters, Cardiff; B. Conway and Co., tin-plate manufacturers, Pontnewydd, Chivers and Son, tin-plate manufacturers, Kidwelly; Caldicott Iron and Wire Company, wire manufacturers, Caldicott; Richard Cory, jun., coalmaster, Cardiff; John Cory, coalmaster, Cardiff; James Clark, coal and ironmaster, Manchester; Daniell and Jones, iron merchants, &c., Newport; David Davies, ironmaster, College Works, Cardiff; Lewis Davis, coalmaster, Cardiff; E. F. Daniell, tin-plate manufacturer, Swansea; Elford, Williams, and Co., merchants, Swansea; Webster Flockton, colliery manager, Llantrissant; Edward Finch, ironmaster, Chepstow; P. S. Flower, tin-plate manufacturer, Neath; Furness Iron and Steel Company, Askham-in-Furness; W. Forester, merchant, Swansea; C. H. Gratrex, coal agent, Newport; F. G. Grice, ironmaster, Cwmbran; A. B. Gullan, metal broker, &c., Swansea; George Harrison, manager, Mon. Railway Company, Newport; L. A. Homfray, coal merchant, Newport; S. G. Homfray, merchant, Swansea; J. S. Hollyer and Co., merchants, Cardiff; Samuel Homfray, merchant, Newport; E. Higgins, timber merchant, Newport; John Dowle Jones, merchant, Swansea; Jacob James, agent, &c., Newbridge; John James, metal broker, &c., Newport; Alfred Jacob, mining engineer, Newport; Henry M. James, ironmaster, Parkend, near Lydney; John Jayne and Co., coal and ironmasters, Brynmawr; J. J. Jenkins, tin-plate manufacturer, Swansea; Chas. Jordan, iron founder, Newport; S. W. Kelly, merchant, &c., Cardiff; Landore Tin-Plate Company, tin-plate manufacturers, Landore; Leach, Flower, and Co., tin-plate manufacturers, Neath; John Lysaght, ironmaster, Bristol; John Lewis and Co., tin-plate manufacturers, Tydee, near Newport; Livingston, Richards, and Almond, coalmasters, Swansea; David Llewellin, mining engineer, Pontypool; John Lawrence, iron and coalmaster, Cwmbran; Millbrook Iron Company, ironmasters, Swansea; J. Y. and F. Moggridge, tin-plate makers, Caerleon; Mackean and Co., merchants, Cardiff; David Morris and Co., tin-plate makers, Briton Ferry; Geo. J. May, chain and nail manufacturer, Neath; T. J. Margrave, coalmaster, Llanelly; James Maddocks, merchant and broker, Newport; James Murphy, civil engineer, Newport; Francis Nash, iron ore and coal master, Coleford; Nixon, Taylor, and Cory, coalmasters, Cardiff; Old Castle Iron and Tin-Plate Company, tin-plate manufacturers, Llanelly; John Pearce, metal broker, Crumlin; Charles H. Page, agent, Cardiff; Alfred Pilliner, engineer, Newport; Charles D. Phillips, agent and merchant, Newport; R. S. Roper, merchant and metal broker, Newport; Edward Riley, wire manufacturer, Pontnewynydd; W. Rosser, C.E., estate agent, Llanelly; J. Railton, timber merchant, Newport; John Senior and Co., metal brokers, Liverpool; H. A. Swan, metal broker, Cardiff; J. E. Swan and Brothers, metal brokers, Middlesborough; Henry Strick, ironmaster, Pontypool; C. Simpson, agent, Newport; George Strick, ironmaster, Swansea; Trotter, Thomas, and Co., coalmasters, &c., Coleford; W. Thomas, tin-plate manufacturer, Landore; J. S. Tregoning, tin-plate manufacturer, Llanelly; Thomas Vaughan, ironmaster, Middlesborough; R. Wrightson, merchant, &c., Newport; S. J. Wood, merchant, &c., Newport; C. H. Waring, engineer, Neath; John Warren, engineer, Newport; William West, coal agent, Newport; P. A. Williams, coalmaster, Abertillery; P. T. Woodruff, tin-plate manufacturer, Machen.

In order to strengthen the hands of the committee, it was proposed by Mr. J. W. JONES, seconded by Mr. DAVID MORRIS, and carried unanimously:—

"That the following gentlemen be requested to act on the committee:—Mr. Alex. Dalziel, Cardiff; Mr. F. G. Grice, Cwmbran; Mr. John Lawrence, Cwmbran; Mr. George Levick, Cardiff; Mr. W. Malcolm, Seend; Mr. Josiah Richards, Pontypool; Mr. C. A. Browne, Tredegar; Mr. R. J. Thomas, Ynispenllwch."

A number of letters, emanating from many districts in England, were put in to show that the proposed markets were considered to be very desirable; and the hon. sec. was instructed to address another circular, requesting attention to those previously sent out, with a view to obtaining wide and general interest in and support of the weekly markets.

The Hon. SECRETARY then stated he had received from several quarters very strong opinions that the proposition to have the markets on alternating days might lead to serious trouble and inconvenience; and after careful consideration it was proposed by Mr. CHARLES CONWAY, seconded by Mr. L. A. HOMFRAY, and carried unanimously:—

"That the weekly market shall be held at Newport on Wednesday, and at Swansea on Saturday, in each week—the first market to be held at Swansea, at the Mackworth Arms Hotel, on Saturday, March 4."

The next meeting of the committee was fixed for Feb. 15, at the Royal Hotel, Cardiff, at Two P.M.

The proceedings terminated with a vote of thanks to the Chairman.

THE SOUTH MIDLAND INSTITUTE OF MINING, CIVIL, AND MECHANICAL ENGINEERS.

A monthly meeting of members was held at the Exchange, Wolverhampton, on Monday. Mr. J. P. BAKER (the Government Inspector of Mines), President of the Institute, was chairman; and there were also present—Messrs. H. Beckett, F.G.S. (past president), James Cope, F.G.S. (hon. secretary), Silas Bowkley, F.G.S., T. Rose, W. Ness, D. W. Lees, James Bromley, J. Parry, H. H. Beckett, W. Parton, H. Willcock, jun., J. W. Baker, R. Adkiss, W. Brickley, J. Laxton, J. Fereday, E. Phillips, C. Simmonds, Wm. Fenn, Wm. Davis, jun., Stephen Watkins, and John Spittle.

Mr. Edwin Hooper (Mayor of Tamworth), Mr. J. Naylor, and Mr. G. Pringle were elected ordinary members, and Mr. D. Jones a hon. member.—The hon. SECRETARY announced that the members now stood at 6 patrons, 14 honorary, and 146 ordinary. A total of 166 members in 20 months was, he thought, very encouraging.

Mr. COPE then announced that Mr. Bowkley's paper "On the Extension of the South Staffordshire Coal Field" would have to be postponed till the next meeting. The weather had been so adverse it had been impossible to explore certain portions of the boundary. Now, however, that there was a favourable change in the weather no further difficulty would be experienced, and the survey would be gone on with. At the next meeting the institute might confidently look for a plan and section of the whole coal field. These would show so many square miles in addition to the quantity that it was before supposed they possessed.

Mr. BROMLEY then brought before the meeting the magnetic lock for safety-lamps, invented by Messrs. Craig and Bidder. He explained that he had had his attention directed to the subject by having found the locks in use at collieries in Derbyshire. They were also, he understood, at use at the collieries in North Staffordshire, of Mr. G. Elliot, M.P., and they were about to be adopted by Mr. J. T. Woodhouse. The lock, which was fully described and illustrated in the *Mining Journal* of June 5, 1369, can be applied to any of the lamps at present in use; it consists chiefly of a pin worked either upon the lever or direct-action principle, so that pushing the top and bottom of the lamp together prevents it from being opened by the miner, for it requires a powerful battery, or an equally powerful magnet, to release the pin. This being kept either upon the bank, or in the lamp-cabin, or both, the lamp cannot be tampered with by the miner. Mr. Bromley illustrated his remarks by diagrams, and by letters from the inventors, and said he had brought on the matter because he had seen so much recklessness by men, with whom lamps were entrusted for their own safety.

The PRESIDENT said that the subject was one of great importance to such an institution as theirs, and desired Mr. Bromley to prepare a complete paper on the subject for the next meeting. On his own part, and perhaps Mr. T. Rose would aid him, he would try and contribute to the subject by showing what the North of England Institute had done in experimenting upon the conditions under which safety-lamps would fire in gas, even when locked.

The SECRETARY announced that during the sinkings on the Sandwell property the company who were conducting the operations had come upon water, which was much to be regretted, though not cause for surprise.

Mr. LAXTON said that the water was at the Bullock's farm sinking and of no great magnitude.

The PRESIDENT expressed the earnest hope, not only of himself but also of the whole institute, that nothing would occur to prevent the noble and enterprising work in which their friends were engaged from proving a distinguished success.

Mr. SPITTLE concurred in this hope, yet always felt quite satisfied that there were difficulties in the way in this matter that would prove much more serious than had been contemplated by the promoters, if he might judge from what had hitherto been made public as to their expectations and the result of their working hithe rto.

Mr. J. W. BAKER stated that in the Coppy Hall District (Aldridge) the ground through which the sinkings were be ing driven was leading the gentlemen who were pushing the matter to believe that they would attain very satisfactory results.

The meeting broke up, after the past President a nd Mr. Ness had dissented as geologists from certain views that are bein g now advanced by scientific men as to the vast antiquity of the origin of the human race.

THE MIDLAND INSTITUTE OF MINING ENGINEERS.

A meeting of this Association was held at the Queen's Hotel, Leeds, a few days ago, Mr. T. W. Embleton, mining engineer, in the chair. Above 50 members of the Institute were present, the general attendance including Mr. Evans, the Government Inspector of Coal Mines, A new safety-lamp, of a very ingenious description, was exhibited by Mr. Teale, of Withy Grove, Manchester, and it was the subject of general approval. Mr. Hodgson's paper "On Long Wall Work" (as published in the *Mining Journal*), was discussed; and Mr. King exhibited a safety-cage and disengaging-hook for cases of over-winding, which was highly commended.

Mr. P. Cooper, of the Holmes Colliery, near Rotherham, read a paper "On Pumping Water from the Barnsley to the Wathwood Bed, at the Holmes Colliery." It appears that until about nine months ago the water was raised in large cisterns, holding about 2 tons of water, which, besides occupying the shaft and engine several hours per week, was found in many respects injurious and objectionable. Force-pumps were attached to the underground hauling-engine, by which the water was forced 180 yards up the shaft, at the rate of from 250 to 300 gallons per minute, thus giving an independent mode of dealing with the water, and so liberating the shaft for other purposes. The details of the arrangement were fully described, and large plans of the different parts of the apparatus used were exhibited, as were also those relating to the engine. Great interest was manifested in the application, as described, which is new in Yorkshire. The advantages are that, as little space is required in the coal shaft for the pumps, no spears or pump-rods being required, the pumping can be done at any time without interrupting other work, the engine daily used for hauling coal from the dip of the mine being used for the purpose, thus economising the capital expenditure for power, and ensuring great economy in raising the water, the cost of which was stated to be less than 1-12th of 1d. per ton.

Then followed an excellent paper by Mr. W. H. Chambers (Messrs. Newton, Chambers, and Co., of Thorncliffe Collieries, near Sheffield), "On Outbursts of Gas." Mr. Chambers described five outbursts of gas that had occurred in the Silkstone bed at the Thorncliffe Collieries. The first occurred when naked candles was used, and the second at the furnace, it being fed with the return air from the workings. Till then, within the experience of Mr. Chambers, at these collieries outbursts of gas were unknown. The coal is worked in this manner:—The levels or main roads are driven about 20 yards apart. Every 200 yards along the main, or hurrying level, a pair of bords, or one bord and a leading bank, are driven to the rise into the level above, a distance in the Sowhill dips of from 140 to 200 yards. To every 20 yards up the straight bord an ending is driven, which comes into the back bord of the first set, or into the leading bank. When the ending is holed through, a bank from 16 to 18 yards is taken bord-way of the coals, until the next ending is reached. A packgate is made up to fast end of the bank for hurrying purposes, which serves also as an air-way when the next bank is coming up. The air is let in at the bottom of the bord, a sheet or door being fixed just above the first ending, and a regulator is placed at the top of the set of banks. Mr. Chambers next proceeded to describe the five outbursts of gas in question. The first occurred on the 4th of April, 1862, a little after eight o'clock in the morning. The day deputy was in the place about 7 o'clock, found it "on the weight," and warned the men to come away if it got more dangerous. This applied to the roof. There was then a little gas far back in the "goaf," and ultimately this fired at a candle, eight men being burnt, of whom six died. The cause of this great fatality was not so much the extent of the explosion as the running about of the men amongst the burning gas instead of at once throwing themselves upon the floor. For about ten hours the gas continued to come from a crack in the floor, and then entirely ceased. The floor at the place of outburst was heaved up for a distance of about 60 yards up the bank gate and along the face of the coal.

At the second outburst, on Oct. 8, 1862, no one was in the pit except the furnace man, and he was burned to death. A good brisk fire was found in the furnace, and three doors between the downcast and the upcast were completely demolished, not a particle being found. The flags at the top of the incline were broken like matchwood, and the wire-rope twisted like a piece of whipcord. It was three days before the place was in a fit state for working, and the gas continued to issue from the cracks in the floor for seven days afterwards so strongly that it would fire at a lamp. The heaving of the floor in this case was more violent than on the former occasion, but the distance heaved was about the same—60 yards. By outburst No. 3, which occurred on Feb. 15, 1865, and which the men said resembled the blowing off of a number of steam-boilers, the floor was heaved up to the same extent—about 60 yards—on the face, and up the bank-gate. When the place was reached, 36 hours afterwards, a hole was sunk down for the purpose of ascertaining from what depth the gas came. This was sunk to a depth of 4 ft. into the rock, which at this point is 3 yards thick; below is a very strong stone-bind, 8 yards thick. The rock and stone were heaved up, and a crack 7 yards long and 2 yards broad was found, from which the gas was coming. This crack extended endway of the strata along the face of the bank, and seemed to run into the goaf, so that the length could not be fully ascertained. In No. 4 outburst the workings had been carried in a different direction into a neighbourhood were "throes" existed, and, consequently, acted as feeders, at which the gas could escape. In No. 5 outburst the ground was again heaved up about the same distance—60 yards—but more violently than before. It will be observed that there are several features common to all the outbursts he had described. First, that the place of outburst has in all cases been the same—No. 2 ending. Second, that the workings were worked back to about the same point. Third, that the outburst has always been accompanied by a weight more or less heavy. Fourth, that the area or distance of heavage has in all cases been the same, although varying in force. Fifth, that the outbursts have occurred at regular distances, in the case of Sowhill dips, and that the same appears to be taking place at Tankersley pit also.

There was no doubt that the opinion expressed by Mr. Embleton, when he visited the scene of the second outburst, was [the correct one, for he said that no amount of ventilation would, for the time being, be able to cope with the forces with which colliery proprietors had to contend. At the same time, they had at hand a means by which they could pass away the gases harmlessly. There should be the most strict attention to discipline in the pit, the utmost care exercised in reference to the lamps used, for a watchful vigilance constantly exercised by the stewards and overmen would generally be sufficient to render such outbursts perfectly harmless. The long wall method of working appeared to him to offer more immunity from these calamities, for there the weight was more gradual, the packs not so numerous, and the gas was thus released more gently, and in less quantities. Boring has been another method suggested. At Tankersley Pit a bore-hole has been put down a distance of 40 yards, but no gas has been found, and the hole is perfectly free from water. One thing was certain, that up to the time of the adoption of the present sy s-

tem of working in the Silkstone seam at Thorncliffe there was perfect immunity from such occurrences. No doubt this was partially owing to the working getting gradually into the deep of the coal, and also partially to the fact that in many instances the "softs," or bottom coal, was left in, though he did not attach much importance to the latter, for what would heave the rock with the force which was present in the above instance would not, surely, be prevented coming off by a few inches of coal. He was, therefore, inclined to think that if a trial were made of the other modes of working that had been suggested it might lead to better results.

The papers were well received, and after several new members had been admitted into the society there was a dinner, under the presidency of Mr. Embleton, after which various interesting trade topics were discussed in a conversational manner.

SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE INSTITUTE OF MINING ENGINEERS.

An ordinary monthly meeting was held on Monday, in the Museum, Dudley; the president (Mr. Joseph Cooksey) in the chair. There was a large attendance, including Messrs. W. North, J. Lindop, W. H. Hall, J. M. Fellows, J. Hughes, E. Davis, T. A. Bayley, J. Harrison, G. Taylor, J. Latham, S. Bate, B. R. Smith, G. Spruce, T. Walton, Hayward, Field, Callear, Ritson, and H. Johnson (hon sec.)—The first business was to consider whether a very fine section, showing the intrusion of green rock into the coal measures, prepared by Mr. Richard Latham, should be reduced in size, affixed to the "Transactions," and thus supplied to every member of the Institute. The hon. secretary (Mr. Henry Johnson) spoke strongly in favour of the scheme, and said that kindred societies had promised to purchase copies. It was determined to publish the section in the manner described above.—Mr. George Taylor was elected a member.—Mr. Lindop proposed a gentleman for election at next meeting.

The hon. secretary said he had to bring before that meeting a book upon ventilation in mines, by the late Mr. J. J. Atkinson, who was for many years a Government Inspector in the North of England. Mr. Johnson spoke highly of the deceased, and called to the members' minds the gentlemanly manners of Mr. Atkinson, and the services he had rendered to their Institute. The members agreed that the work should be purchased by them as individuals, and several orders were at once given.

Mr. North reported that Mr. Williams, M.E., at Cannock and Rugeley, was using the Hardy pick, described a month or so ago, and that the miners liked the change very much. Mr. Jonathan Harrison, of the Watnall Colliery, described his improved pick, which was an improvement on the Hardy pick. Both had many points in common; but the shape of Mr. Harrison's pick was considered by the members to be by far the best, and Mr. Harrison was advised to obtain the specifications of Mr. Hardy's patent, in order that he might not interfere with that gentleman's rights.

The hon. secretary explained to the meeting that the report of the great influx of water into the Sandwell sinking was exaggerated. What had occurred was nothing more than was expected months ago. He had to report that the winding engine would soon be at work—in about a fortnight—when the difficulty would be readily overcome at a slight cost.

LECTURES ON GEOLOGY—No. II.

The second and concluding lecture on the Geology of the Neighbourhood of Dudley, was delivered, in the Geological Museum, Dudley, on Monday, by Mr. W. MADELEY, secretary of the Dudley Geological Society. The first appeared in the Supplement to last weeks' Journal.

After a brief recapitulation of the subject of the first lecture, the lecturer continued as follows:—The newly deposited coal measures were not permitted to remain long in that tranquil and horizontal condition in which they were so gradually formed. If you look at a geological map of any of the coal fields, you will observe it crossed by a number of white lines, which represent faults. These faults, to which I am now alluding, must not be confused with those great faults which are called boundary faults, and represent what appears on the surface to be the line of demarcation, separating the coal fields from the surrounding later deposits, but are faults which traverse the coal field itself, and in some parts are very numerous. On referring to the horizonal section before you, you will observe a sudden fall or downthrow of the coal on the western side of the Castle Hill, which represents the Russell Hall fault, this will give you an idea of the general character of faults, though sometimes they assume the peculiar form shown in the Dudley Port trough fault, which you see on the eastern side of the Castle. Many of these faults or irregular subsidences took place soon after the consolidation of the coal measures, and were caused by the unequal contraction of the heterogeneous materials of which the different beds were composed. If you take up a few pieces of the shale found near the coals, you will see smooth irregular surfaces, slickensides, which are the result of that creeping of the superincumbent measures which produces these faults. You will easily understand that in coal mining, this want of coherence frequently gives rise to the most lamentable accidents, for large masses of the roof fall down continually through losing the support of the solid bed below them. These faults sometimes succeed each other in a series of steps of a few feet, but sometimes they drop the coal 100 yards or more. One of these great faults is met with on the western side of the coal field, where the downthrow of the coal ranges from 60 to 100 yards. It has, no doubt, seemed strange to many to speak of the deep ocean having flowed over the district we inhabit, and it will appear equally marvellous to tell you it has been subjected to violent volcanic convulsions. Of the fact itself, however, there is not the slightest doubt. The basaltic rock of which the Rowley Hills, Barrow Hills, at Pensnett, and Powk Hill, near Walsall consist is undoubtedly of volcanic origin, and the remarkable way in which it has penetrated into the coal measures, and the effect it has produced on the coal, &c., with which it has come into contact, prove most unmistakably that it was thrown out in a molten state, and intruded into the coal measures with intense force. For some time it was thought that the Rowley Hills were entirely composed of basalt, but within the last few years, explorations in search of coal have been made beneath the hills, and a large quantity has been obtained. It will, probably, be found that, as elsewhere, there is only a thick capping of basalt. Should this prove to be the case, a considerable area of thick coal will be added to our rapidly diminishing stores. But besides these hills of volcanic trap-rock, there is frequently found in coal mines a sheet of green rock, as it is called, which is another part of that great lava stream which flows over our district. This is found in the shape of a horizontal sheet of rock, which extends over a considerable part of the coal field, and sometimes attains the thickness of 60 feet. The average thickness, however, is not more than 30 ft. In mineral composition it is identical with the basalt of the Rowley Hills, or Rowley Rag, though in appearance they are a good deal unlike each other. Whether there is only one sheet of this green rock spread over the district, or whether there is not a second to be met with in some parts, is a question I am unable to decide. We do know, however, that an immense quantity of this molten matter was intruded into the coal measures, and extended over an area of many square miles in an almost unbroken sheet. In its passage it not only squeezed together the incumbent strata, but it materially affected the nature of the coal, frequently charring it, and destroying its bituminous properties.

Perhaps nowhere about here is this injury to the coal greater than at Pensnett, where, in some of the Earl of Dudley's pits, the green rock and the coal are intermingled so much, that if one did not understand the matter one would be puzzled to tell whether the coal had not been intruded into the green rock, instead of *vice versa*. At Pensnett, too, a very great deal of the coal has been materially affected by proximity to the heated mass of rock, and the contiguous shale is baked into a hard china-looking material. We know, however, that this extensive eruption did not take place until after the faults in the coal field had been produced, for we find that the green rock is affected by these faults as much as the other measures are. When this great eruption of volcanic force took place we cannot exactly determine, nor even whether it occurred whilst the surface of the land was still subsiding and covered by the water, or subsequently, after it had been again upheaved. It certainly did occur before the coal measures were covered by the later Permian rocks, for we find that in no instance has the green rock been found to penetrate into these beds. It is generally supposed that the outburst occurred towards the close of the carboniferous period. It must have been late in this period, also, that that great upheaval of the Castle Hill, the Wren's Nest, &c., took place, for we find that the coal measures, up to and including the brooch coal surrounding these hills, were all thrown up by the same force, and may be traced cropping out in successive order, beginning with the lowest beds nearest to the anticlinal, and the highest beds furthest away, just as would be the case if we put a lot of boards on each other, and then broke them through the middle, and tilted them up against each other. The fact of this occurrance having taken place towards the close of the carboniferous period, and that the volcanic eruption of which I have been speaking also took place before the commencement of the Permian period, naturally leads to the probability that the events were simultaneous, though, on the other hand, it must be admitted as possible that one was not necessarily the result of the other. There is no doubt that after the coal period the surface of the land was again upheaved above the water, and the period during which it remained so was probably a long one, for we find that the succeeding beds which were superimposed on the coal measures are of a very different character, indicating changes which must have taken a very long time to accomplish. The difference in the nature of the carboniferous and Permian rocks, and the great changes in the life of the two periods, both go to prove that between the deposition of these two series of rocks a very long period elapsed.

Now, I must call your particular attention to what occurred during this interval of deposition, for it is a subject having the most important bearing on the extension of our existing coal fields. The very same operations were going on during this time, which we described as having occurred after the deposition of the Silurian rocks in this neighbourhood: the surface of the land was exposed to that aerial denudation which swept whole beds away in some parts, and carried away the *debris* to be re-arranged elsewhere. The effects of rain, rivers, torrents, and frosts on beds like the coal measures must have been great and comparatively rapid, owing to the soft nature of the materials to be worked upon, and the extent to which this denudation has been carried in other districts may prepare us for believing that in our own neighbourhood this destructive agency has made most serious inroads on our coal fields. In the North of England, Mr. Hull says that "a thickness of no less 10,000 feet of the coal measures had been carried away before the deposition even of the lower Permian rocks, which were thrown down upon the already disturbed truncated edges of the coal strata."—(Lyell's "Student's Elements of Geology," page 578.) It would be absurd in me to hazard an opinion as to the extent to which this denudation of the coal measures was carried around the South Staffordshire coal field; that is a question which can only be solved by practical experiment, but it is wrong to attempt to conceal the effect which this agency must have produced, until arrested by the coal measures being covered by the Permian rocks. It is certain that very near to us the lower coal measures, to which our own coal field is supposed to belong, have suffered considerably from this cause, and it is by no means improbable that the effects may be found to be more widespread than we imagine. No one, however, I am sure, could be found who would not join me in hoping that the Permian and New Red Sandstone around our coal field conceal treasures of this important mineral, destined to give employment and be the means of happiness and prosperity to future generations of our descendants. I must now briefly describe to you the Permian beds, which you will see on the edge of the coal field (coloured brown), and which overlie the coal measures, which they succeeded in the regular order of deposition. They consist of reddish brown clays, sandstones, and conglomerates in the lower part, and the water-worn pebbles of which these conglomerates are formed indicate that they have been ground on a sea beach. The specimen before you is a piece of this conglomerate, or pudding-stone, as it is locally called, in which the rounded pebbles of quartz are imbedded in a marly paste, which has been fixed altogether by a calcareous cement. This bed may be seen just outside Baggeridge Wood, and whenever it is found the coal measures cannot be far beneath. It is through these lower Permian beds at Sandwell that sinking operations have been commenced, and if the pits are carried down through the Permians, the thickness of which is a matter of some uncertainty, though they are undoubtedly of no inconsiderable thickness there, the great problem as to the extension of the coal field in that direction will be in a fair way to be solved. We may reasonably expect that to the west of the coal field especially we may find a similar course of succession to what may be met with on the east, except that on the east there appears to be additional danger from the chance of the Silurian rocks having risen into lofty heights, on which the coal was never deposited. The probability of this occurrence is particularly pointed out by Mr. Hull, in a work lately published by the Geological Survey "On the Permian and Triassic Rocks of the Midland Counties of England."

The next succeeding bed of the Permian rocks to which I must call your attention is the Permian breccia, which you will find largely developed to the south and west of the coal field. At Clent, it forms the whole range of the hills, at Wassell Top, near Kidderminster it is also found, at Enville also, and at Church Hill, in the middle of the Wyre Forest coal field. This bed is called breccia from its broken, shattered condition (the word being an Italian one), and consists of large and small fragments of different kinds of rock, the angles of which, instead of being rounded and water-worn, are generally sharp, and indicate that they have not been subjected to the grinding action of a sea beach. The stones consist of porphyry, felstone, quartz, slate, and other kinds of metamorphic rocks, imbedded in a red marly paste. These stones could not have been derived from any of the rocks which we know of as existing in this neighbourhood. We must, therefore, come to the conclusion that they have been transported to the position in which they now lie from some other districts. The origin of this peculiar thick bed of sharp-angled stones was quite mistaken for some time, until Prof. Ramsay advanced the theory that they had been conveyed by icebergs which, as they gradually melted, left behind them the pieces of rock which had been frozen into them as they were slipping seawards down the sides of the rocks. On examining carefully the character of the stones on the Clent Hills, he found they were remarkably like the Cambrian, Lower Silurian, and Igneous rocks, found in West Shropshire at the Longwynd and Caradoc Hills; and he, therefore, inferred that the glaciers which covered those hills during this epoch were the means by which these stones were transported. There is no doubt that there was originally a continuous bed of these ice-borne fragments, the total area of which Prof. Ramsay states was not less than 500 square miles. These great climatal changes are almost inconceivable, but when we find that on the sides of Moel Tryfaen, in Wales, at the height of 1400 feet, marine shells have been found, which from the identity of the majority of them to shells of our own day prove that they must have lived and died there in almost recent times, surely we cannot refuse our belief in an alteration of climate which must have been productive of no greater change in far more remote ages. If you go over the Clent Hills towards St. Kenelm's church, you will find two quarries in the side of the hill, where you may obtain any quantity of these angular stones, and by going along the road from St. Kenelm's to the village of Clent you will be able to observe the rude stratification of this remarkable bed. These Permian beds are the highest of that large group of sedimentary rocks which are comprised in the Primary or Palæozoic series, and, as you will see by the chart, are succeeded by the next great group, which is called the secondary or Mesozoic series. The period which must have been necessary to form the deposits of the Primary rocks, you will see by the chart, which is drawn to scale, must have been immeasurably longer than that during which the whole of the subsequent rocks were formed, and indicate a length of time which it is quite beyond the power of man to conceive. Were I to tell you that some geologists compute that 96 millions of years have elapsed since the formation of the Silurian rocks, no doubt most of you would be incredulous, but so would all the astronomers of a few hundred years ago had they been told that the sun's distance from the earth is 96 millions of miles, yet now, the whole of the movements of our solar system are so accurately known, that the eclipses of the sun and moon, and even Jupiter's satellites, can be computed with unfailing precision to within a single second of time.

During the Primary period the only animals existing were low in the grade of organisation, consisting of zoophytes or coral-forming animals, molluscs, or snails, crustacea, like our lobster, fishes, and reptiles. When we come, however, to the secondary rocks we find more highly organised animals, for we discover the remains of birds and mammals. For a proper understanding of these various steps of advance in organisation in the animal kingdom I must refer you to works on natural history, where you will find those differences explained which form the grounds of those divisions into which this science has been formed by naturalists. The secondary series of rocks, then, have been so called because the fossils found therein show the existence of higher order of animals than any which are found in the lower, or primary group. If, however, it were necessary to make this division on evidence derived from the rocks of sandstone, &c., in our neighbourhood, of which these beds are composed, we should fail in determining the line of division, for the New Red Sandstone and Permian rocks about here are particularly barren of fossil remains. True that fossils are sometimes found in the pebble and breccia beds, but they are derived from older rocks, and are no evidences of the forms of life which existed during these two periods. In the lower beds of New Red Sandstone, however, in Connecticut the footprints of birds have been found, which prove that at that time most gigantic birds existed. "The casts of the footprints show that some of these fossil bipeds had feet four times as large as the living ostrich (Lyell)." The beds of New Red Sandstone which are found in this immediate neighbourhood are those belonging to the bunter series, and consist of (1) lower bunter sandstone, (2) the bunter pebble beds, and (3) the upper bunter sandstone. These beds are found in many places around the coal field overlying the Permians. The upper sandstone is frequently met with in the lanes around here, as at Himley, where the road below the Holbeach turnpike is cut through it, and at many other places, as at Green Forge and on the road to Enville it may be seen, as also in the railway cutting beyond Stourbridge, and in many other places. The pebble beds are frequently to be seen in the same neighbourhood, and in the fields this bed is very conspicuous from the enormous quantity of loose quartz stones which cover the land. No doubt you have all been to Enville, and possibly all have had to walk up that long hill past Green's Forge, and perhaps also many of you have been rather nervous in driving down, on account of the sand and loose stones. This is the pebble bed of the bunter. The next series of beds in the New Red Sandstone, the muschelkalk, as it is called, is entirely absent in England. The topmost series is called the keuper series, and consists of two main divisions, the lowest or water-stones, containing a hard compact sandstone, which is well adapted, and very frequently used, for building purposes. This bed is succeeded by the keuper marls, which may be well seen in the neighbourhood of Droitwich and Worcester. Birmingham is built partly on the keuper sandstone, and partly on the keuper marl. Wolverhampton stands partly on the Permian and partly on the upper bunter sandstone. But, I need not detain you by giving you a mass of detail which you cannot be expected to retain in your memory. I can only say, if you wish to learn anything of these matters, if you think there is any solid pleasure to be derived from the study of these subjects, make up your mind to commence the study of the science of geology. I cannot promise you an easy task in attempting to understand all the problems which thoughtful men take delight in investigating, but, from my own experience, I can promise you studies of the most important and interesting character. The proper and only way to commence the study of geology is to get one of the best elementary books your means will allow, and try to master its general principles, and this, when once undertaken in earnest, will not be found so difficult and tedious a matter as it appears at first sight. When once this is accomplished, I can promise you a source of never-failing interest, a study which will provide intense pleasure for you in your daily walks, and will expand your ideas of the beauties and marvels of this nether earth.

PRACTICAL MEASURING AND VALUING.

A master or superintendent, who does not thoroughly understand the minutest details of the work of which he has the control, invariably suffers from the workmen's neglect of their duties; and precisely in the same way the architect and surveyor, who is unable to determine by his own admeasurement the value of work performed under his superintendence, must ever be at a disadvantage in his efforts to protect the interests of himself and his clients. To permit of full information upon these matters being acquired with the least possible labour, a work was some years since published (originally written expressly for the rising student by an eminent architect and surveyor of 50 years experience, and completed after the author's death by Mr. E. Dobson), which has long been the only standard guide to the methods employed by surveyors in their measurement of builders, and the new edition, by Mr. E. WYNDHAM TARN, M.A., just issued, is well calculated to sustain the reputation which the work has so long enjoyed. Being specially intended for the student, care has been taken to supply sufficient preliminary instruction to enable every branch of the subject to be thoroughly understood. In Mr. Tarn's volume* it is remarked that the value of work can only be determined by first ascertaining the cost of the materials expended, and making the necessary allowances for profit and waste, and then the amount of labour in executing it.

As the tradesmen's bills must be passed and signed by the architect, the prime cost of materials may in most instances be obtained without much difficulty, and in all cases may be demanded before the prices charged are allowed. The quantities required per rod, perch, square, or yard, according to the description of work, the architect ought, agreeably to certain rules, to be capable of determining. But many difficulties arise, and the greatest attention is requisite to ascertain correctly the fair average of time to be allowed between the common and best workmen, and also between what men can and what they will do. In the course of study which the book lays down, ample information may be acquired to permit of moderate accuracy being arrived at. The mode of ascertaining by the aid of duodecimals, and at one operation, that $5'7'' \times 2' = 10'2''$ is well worthy of examination, but as tables are likewise given it is probable that the majority of students would trust to obtaining equal accuracy by employing them. The chapter on excavating and well sinking, and that which follows it on brickwork, concrete, tiling, and slating, contain much valuable information, and as engravings are given of the mode of laying in English and in Flemish bond, it is almost to be regretted that the same course was not adopted with regard to a good bond for hollow walls, the use of which in this age of economy is becoming much more general. Carpentry and joinery, masonry and plastering are referred to in the three following chapters, and there is then a chapter referring to the work of the smith, founder, ironmonger, and bellhanger. In the chapter relating to plumbing much valuable information is given with regard to zinc working, the weight and qualities of zinc, and its use for covering roofs, flats, and gutters (which is increasing considerably owing to its peculiarities and the proper mode of treating it being now understood—for an inexpensive and light kind of roofing there is no material that can compare with it) being very fully treated of. Matters relating to the finishing or ornamenting of the interior of the house are carefully detailed in the ninth chapter, and in the concluding chapter, devoted to "various matters connected with the erection of buildings which cannot be classed under any especial trade," limits are given which may be utilised with the greatest advantage.

The book, as a whole, is well worthy the attention of the student in architecture and surveying, as by the careful study of it his progress in his profession will be much facilitated, and he will be the better able to perform the duties entrusted to him with credit to himself and advantage of those engaging him.

* "The Student's Guide to the Practice of Measuring and Valuing Artificers' Works." Originally edited by Edward Dobson, architect. New edition, with additions on mensuration and construction, and several useful tables for facilitating calculations and measurements. By E. WYNDHAM TARN, M.A., architect. London: Lockwood and Co., Stationers' Hall-court.

ENGINEERS' ESTIMATES.—The preparation of estimates is a scarcely less important part of the engineer's business than the carrying out of the works themselves; indeed, unless the engineer be ready in making an estimate it is probable that he will have but little business to trouble him. It is for this reason that "Atchley's Civil Engineer's and Contractor's Estimate and Price Book for Home or Foreign Service," by Mr. W. D. HASKOLL, C.E. (just published by Messrs. Lockwood and Co., of Stationers' Hall Court), will prove of the utmost possible utility to the profession. The particulars refer to roads, railways, tramways, docks, harbours, forts, bridges, aqueducts, tunnels, sewers, waterworks, gasworks, &c., and are, therefore, equally adapted to all branches of engineering. But perhaps the most useful portion of the book is that devoted to specifications for permanent way, for telegraph materials, and for works, plant, maintenance, and working of a railway. The manner in which these specifications are given leaves nothing to be desired, and to many young engineers they will prove invaluable. And, as the author remarks, even in the hands of those having some experience the book will often serve to call attention to matters which in the haste of estimating might otherwise be forgotten. There are very few duties which require greater consideration of almost innumerable subjects, and conditions varying with localities and circumstances, all of which affect labour and materials, than the making of an estimate, as is evidenced by the simple fact of the immense differences which occur almost daily

between tenders put in for the same works even by men of well-known experience. This often occurs in a very simple manner, and merely by losing sight momentarily of some minor conditions which repeat themselves throughout a line of works, or perhaps some single circumstance bearing heavily on some important construction. Mr. Haskoll's book will explain how this may occur, and enable the engineer to avoid the resulting annoyance. There must, however, always, he remarks, be one important ingredient in these matters, and this will be the value of labour, not only as regards cost or wages, and the consideration obtained in the shape of work, but also the amount of labour to be readily obtained, or the cost of importing labour, and then sometimes that of retaining it after importation. The first case will, of course, cheapen work, whilst either of the latter will enhance its value; this on extensive works becomes of primary importance, and requires to be very closely examined into before it is possible to shape a reliable estimate. Careful local enquiries made by some means or other can alone yield satisfaction on this point, and enable us to add or deduct from an ordinary schedule. The book also contains a priced list of contractors' machinery, plant, tools, and fittings which will be found very useful, and is altogether a work which few practising engineers will care to be without.

THE QUICKSILVER MINES OF IDRIA—No. I.

Having been employed for two years in the valuable Government quicksilver mines at Idria, I am happy to be able to supply you with a short description of these works. It is well known that these, as European quicksilver mines, are next in productiveness to the Almaden quicksilver works in Spain.

The quicksilver mines of Idria, in the province of Carniola, were discovered at the end of the sixteenth century, in the year 1490. It is said that a farmer found mercury in the bottom of a wooden dish, which he laid under a well to see whether it was water-tight. The mining town of Idria lies 31° 42′ of the meridian of Ferro, and 45° north of the equator, 1053 ft. above the Adriatic Sea, in a round valley on the western side of the head ridge of the Julian Alps. The river Idriza runs through the valley in a northern direction, into which flows the rivulet Nikova from the western side of the valley. The greater part of the town is built on the west side of the river Idriza, on both sides of the rivulet Nikova. The mercuriferous beds are found under the western valley of the Idriza river before the disemboguement of the rivulet Nikova. These beds belong to the Lower Triassic formation of the Alps. The footwall of the deposit consists of thick banks of magnesian limestone, with pecten, miocites, and avicula venetiana. The strike of the deposit is from south-east to north-west, the inclination about 30° to the north. The succession of the metalliferous seams from the foot to the top or hanging-wall is the following:—

1.—The magnesian limestone is overlaid by a grey micaceous and quartzose sandstone, about 30 ft. in thickness.

2.—Then follows a bituminous slate, named "Lagerschiefer," sometimes even 60 ft. thick. In this slate occurs layers of 12 in. of magnesian limestone. This seam is of great importance, because it is the bearer of the richest ore of cinnabar. This cinnabar is chemically not quite pure, but more or less mixed with bituminous and earthy matter, and assumes from this a different colour and appearance, after which the quicksilver ore is termed as follows:—*a*. Stahlerz (steel ore), 80 per cent. mercury. *b*. Ziegelerz (brick ore), 67 per cent. mercury. *c*. Lebererz (liver ore), 40 to 50 per cent. mercury. *d*. Korallenerz (coral ore): this ore is found near the underlying sandstone, with many oreyfied remains of gasteropodes, the name of which is yet not determined. The presence of organic matter in this ore speaks well for the great quantity of phosphate of lime which the ore contains.

3.—The next over the lagerschiefer are thick bands of magnesian limestone and conglomerates of dolomite, even 200 ft. in thickness. The conglomerate consists of pebbles of dolomite, cemented together with a clayey and bituminous matter, and is impregated with cinnabar. Clean cinnabar is mostly found in the dolomite; the steel and liver ore (stahlerz and lebererz) in the conglomerates, because more bituminous.

4.—Grey clayey slates, of great thickness, are overlying the conglomerates, and form a deep basin, caused through the dislocation of the strata. The line of fracture being parallel to the strike of the beds is supposed to have caused a shifting and vertical displacement of the strata, by which the south-west portion of the seam was thrown down. The clayey slate is termed "Silberschiefer" (silver schist), because it is impregnated with metallic mercury.

5.—The hanging-wall of the murcuriferous deposit consists of beds of red and green sandstone (Werfener schiefer or Bunter sandstein); the New Red Sandstone, with shells of ceralites, naticella, and miocites, and of bituminous limestone (Stinkstein or Guttensteinerkalk), rich with petrefacts of shells, Turbo recticostata, and Ceratites cassianus. Both these seams are referred to the Lower Alpine transformation.

6.—Then follow beds belonging to the Upper Alpine Trias (variegated marls), consisting of beds of limestone, about 6 feet in thickness, and of small seams of sandstone and marls, with Halobia lomeli.

7.—From the Lias formation are found black marl schists and grey limestones, with remains of plants, Criptina raibeliana.

8.—Mighty banks of marls, sandstones and limestones, and limestone conglomerates form the top of all the strata belonging to the Upper Chalk formation.

In the north-western part of the mine the seams change their strike to a northern and north-east direction, while their inclination remains nearly the same, so that the deposit assumes the appearance of a basin. In the south-eastern part of the mine the lagerschiefer seam, being a bituminous and clayey schist, of black colour, loses its bitumen, and becomes a grey clayey schist, with much iron pyrites, and changes often to sandstone. In the furthest south-east direction the lagerschiefer disappears entirely, and instead of it follows the dolomite of the hanging or top wall, which is sometimes mercuriferous or bituminous.

MINING ON THE PACIFIC COAST.

That miners are generally of sanguine temperament is an acknowledged fact, yet this can scarcely excite surprise when the enormous profits (surpassing, indeed, the amounts expended in almost innumerable failures), which a single success yields them is taken into consideration; and while this sanguine nature may lead them to neglect to give full prominence to the dark side of the picture, it must not be forgotten that mine reports are frequently most carelessly read, and without a thought of the special circumstances by which the mines are surrounded. Just recently the attention of the public has been constantly directed to the mines of the Pacific coast of the United States of America; and although in some cases the amount of purchase-money demanded has been large, the extent and richness of the mines have been large in proportion. With respect to the mines of the Pacific coast, they are all comparatively young and undeveloped; and as the facilities for reaching the mines, and especially for taking heavy machinery there, are exceedingly limited, it is useless for a mine surveyor to estimate the cost of unwatering deep mines, and base his calculations of profit upon ores obtainable even at depths which, in Cornwall or other long-wrought mining districts, would be regarded as comparatively shallow. In most of the Pacific States operations have to be carried on far from human habitations, unless we honour with that title the wigwams of such tribes as the Apache Indians; so that the ore must be obtained by the rough-and-ready methods common in the country, and the precious metals must be extracted on the spot, thus reducing the burden to be sent home for the payment of dividends upon the capital supplied for the establishment of mining companies. And fortunately the dividends paid to the shareholders in mining undertakings in those regions afford abundant evidence that neither the difficulties of access nor the presence of the Indians seriously interfere with mining operations. The subjoined list shows the amount paid in dividends by a few of the principal companies during last year:—

Amador	$155,400	Kentuck	$ 30,000
Argenta	21,000	Meadow Valley	150,000
Black Diamond Coal	300,000	Metropolitan Mill	10,000
Chollar Potosi	658,000	Natoma Water and M.	6,000
Eureka	430,000	North Star	16,500
Golden Chariot	75,000	Original Hidden Treasure	32,000
Golden Rule	3,000	Sierra Nevada	37,500
Gould and Curry	48,000	Union	30,000
Hale and Norcross	504,000	Wheeler	6,000
Ida Elmore	20,000		
Total			$2,532,400

From the, perhaps, too careful consideration of the surrounding circumstances, reports of Mr. John Arthur Phillips and of Mr. Melville Attwood, made in 1866, seem to have been completely misunderstood, and hence those reports have even recently been referred to with a view to bring an adverse influence to bear upon companies now projected for developing mining properties in the Pacific States, but still in quite a different district. Knowing the impracticability of deep mining, Mr. J. A. Phillips merely stated the probable realisable profit from the ore within reach with the appliances likely to be at disposal, and Mr. Melville Attwood seems to have adopted the same course. This system is usually followed in this country with regard to coal seams, in order that the capitalist may judge whether he is likely to get his capital returned with a good interest upon it within a period which he considers reasonable.

Whether the mines to be worked are situated in California, Nevada, Colorado, Arizona, New Mexico, or elsewhere, it is essential that the capitalist should thoroughly ascertain, before parting with his money, that the property to be purchased is capable of returning a profit of (say) 10 or 20 per cent. upon the outlay, and of reimbursing him the capital also within five or six years; a larger or smaller margin of profit, of course, being allowed according as the risks and difficulties of working are greater or less than usual. It was very pertinently remarked by a correspondent, whose communication was published in the Supplement to last week's *Mining Journal*, that at San Francisco (the city upon which the miners of all the Pacific States are in a great measure dependent for their supplies) funds cannot be raised below the local rate of interest of 5 per cent. per month, or 60 per cent. per annum, and that, consequently, properties which are beneath the notice of San Franciscan capitalists are capable of returning profits which, were the mines in this country, would be considered enormous. These are acknowledged facts, yet people are accustomed to read reports upon mines in the Pacific States precisely as though they were situated in England.

Scarcely sufficient time has yet elapsed for much to be expected in the way of dividends from the mines in the Pacific States, and worked with English capital, yet already some of them have shown themselves capable of making very large returns of ore. Thus, from the Colorado Terrible Lode Mine two parcels of about 10 tons each have recently been sold, containing 28 per cent. of lead and 500 ozs. silver to the ton; and 39 per cent. of lead and 630 ozs. of silver to the ton, respectively. The ore is stated to increase in value as depth is gained, although the quantity remains about the same. In Colorado copper, lead, and iron abound, as well as gold and silver, and coal deposits have been discovered, which, when thoroughly developed, cannot fail to have an important influence on the prosperity of the whole of the Western States. Colorada has already produced approaching 10,000,000*l*. worth of minerals, and the agricultural produce is ample to support the entire population, and supply the military posts along the Union Pacific Railroad and in New Mexico.

In California the gold bars sent to the Mint during 1870, notwithstanding the insufficiency of rain for the wants of the miners, was considerably over 4,000,000*l*., and the gold bars exported reached nearly 2,000,000*l*.; the export of silver bars exceeded 2,000,000*l*.—giving a total of upwards of 8,000,000*l*. Arizona, New Mexico, and neighbouring States and territories only require systematic development to give as favourable results as Colorado, Nevada, and California, and if English capitalists take but ordinary care to ascertain that the properties they embark in are of the value represented by the vendors they can invest with safety.

STATE AID TO MINING IN AMERICA.—A letter from Philadelphia says—"In the Senate a new species of subsidy granting has been proposed, the object in this case being to aid the mining of the precious metals. In Nevada a very valuable mining property, the "Comstock Lode," is being developed by an expensive tunnel, known as the "Sutro Tunnel." This work, but partly completed, is an undertaking in which large numbers of persons engaged in gold and silver mining take an interest, and the proposition to the Senate, embraced in a measure introduced by Senator Nye (Republican), of Nevada, is to create a "Mineral Land Fund," and to pay over to the Sutro Tunnel Company the proceeds of sales of mineral lands by the United States, to the amount of $30,000 for every 500 ft. of tunnel completed, the entire work to be finished in ten years. In the course of an address on the subject Senator Nye said that the Comstock Lode since its discovery, ten years ago, had yielded $120,000,000 of the precious metals. The mines had now reached a perpendicular depth of 1200 ft., and the great expense attending the workings foreshadowed their abandonment. The tunnel was to remedy these difficulties. It would have a length of seven miles, and reach under the mines at the depth of 2000 ft., drawing off the water, aiding ventilation, and reducing the mining expenses to one-twentieth, besides greatly increasing the product.

THE MINERAL RESOURCES OF VICTORIA.

The extent surveyed under the direction of the Geological Department of Victoria has already exceeded 3500 square miles, or 2,246,400 acres, and in obedience to the instructions of the Minister, Mr. R. BROUGH SMYTH, the Secretary for Mines, has submitted a carefully considered plan for the completion of the work. Already 65 sheets of maps, upon a scale of 2 inches to 1 mile, with the boundaries of the several rock formations carefully delineated, and accompanied with many useful notes, have been issued; and these embrace 338 square miles of granites, in which no veins of ore of economic value have yet been discovered; 27 square miles of porphyries, representing areas of no special interest at present to the gold miner; 742½ square miles of Upper and Lower Silurian rocks, intersected by veins containing gold, antimony, &c., many of which are not shown on the maps; 45 square miles of Upper Palæozoic, chiefly interesting as connected with the coal-bearing rocks; 561 square miles of Tertiaries, chiefly marine, yielding fossil remains of great interest to the palæontologist; 1789 square miles of volcanic rocks (basalts, lavas, &c.), covering other formations; and 7½ square miles of limestone, of value to the builder and agriculturist. Thus, less than one-fourth of the total area embraces country which is interesting to the gold miner, and of this part there is not much occupied at the present time. The great gold fields of Ballarat and Sandhurst are not included in it, and yet in such places, if anywhere, the geologist might look for sure profit, as regards the interests of science and practical mining.

The fear is expressed that the continuance of the survey in the present manner, costing about 8000*l*. per annum, would not give results immediately valuable to the miners, agriculturists, and those who endeavour to get profit from the mineral resources of the country; but Mr. SMYTH suggests that there is another, and very different, method of conducting the survey, which, though some might suppose calculated rather to promote the material interests of the colony than to advance science, would afford sound and valuable information to the miners, and would at the same time leave no ground of complaint for those making the sciences of geology and mineralogy their study. He suggests that instead of proceeding with the survey in the line of the strike of the Palæozoic rocks, the country should be surveyed towards the east and west at right angles with the strike, and that instead of mapping with costly traverses the lines of the outcrop of non-productive formations (in the sense of not containing veins of ore or deposits of economic value), there should be surveyed, and levelled, and mapped all the more important gold fields, carrying from one area to the other such necessary connections as might serve the geologist, and assist his investigation. It is of great importance at once to give information to the miners at Ballarat as to the course of the leads, which are supposed to trend southerly and westerly, and if the data which are now available, and other observations which a competent geological surveyor could make, were correlated, the difficulties of the miners would be removed, an impetus would be given to prospecting, and with that confidence which a correct knowledge of the physical structure of this gold field would give much new country would be opened, and renewed prosperity would follow. The plan which Mr. SMYTH suggests appears in every way calculated to meet the requirements of practical men: he proposes to delineate on a map of the Ballarat district the boundaries of the rock formations, the direction of veins and dykes, the boundaries of outliers of Tertiary rocks, the leads and tributaries of leads already explored, the points in such leads where water was met with, the width and a description of the gutters, the character of the gravel and detritus with which the gutters are filled, and as far as possible minute and careful observations on the form and fineness of the gold got in the several leads and tributaries.

It is assumed that in the making of such a survey a vast amount of useful information could be collected, and if, as Mr. SMYTH suggests, careful sections, levelled and chained, and plotted to the same horizontal and vertical scale, it would be practicable to aid the miner in his investigations to prevent loss to him and to the State from unprofitable researches, and to teach him likewise to rely less upon chance than on knowledge. The occurrence of copper and the ores of copper, and rolled fragments of stibnite in the leads at Ballarat, has been known for some time, and yet no attempt has been made to discover the origin of these minerals, or to trace them to the veins in the Palæozoic rocks, whence undoubtedly they have been derived. The extent of the lignite deposits in the neighbourhood of Ballarat, which have been wrought for some time, is unknown, and yet underneath these deposits there lie drifts containing gold and clays of economic value. It would form part of the duty of a surveyor to delineate the ascertained limits of these on his map, and to seek to connect them with the already explored leads. The main object would be to communicate by means of easily understood maps and descriptions sound information, from time to time, in such a form as to attract rather than repel the untrained observer. In proper order, the gold fields of Sandhurst, Castlemain, Maldon, and Heathcote would be examined. As regards Sandhurst, the area is intersected by reefs, but little is known of the greater number of them. Some of them have been proved to be auriferous, and there are no reasons founded on geological investigations which would lead to the conclusion that they are different from the exceedingly rich reefs on the western side of the Bendigo Creek. Even as regards the best known lines of reefs there is still much to be learned. For instance, there is reason to believe that there is some close connection between the constituents of the mineral waters which are found in the lodes and the minerals associated with quartz in the lodes; and, as these, chiefly sulphides, are even now regarded by the miner as affording hints to him in his search for the richer bands of the reef, it is possible, and even probable, that some new light will be thrown on the modes of occurrence of gold by making analyses of these waters, and observing, at the same time, the mineral character of the reefs whence they are taken. Observations made in accordance with a well-considered method may, in short, lead finally to just conclusions in regard to the occurrence, side by side, of very rich and practically barren reefs, and enable the miner, without expensive explorations, to discriminate the one from the other. By collecting data, not in one place but in many, and by using these data only for the purpose of ascertaining the truth, and not to support a theory, it would be possible to give much help to the miner, and at the same time to advance the science of geology.

But it is not alone in connection with gold mining that the mineral resources of Victoria could be developed. Mr. SMYTH remarks that in the south-western part of Gippsland there is an area of 1436 square miles occupied by coal-bearing rocks. Several seams of coal have been discovered in this tract, one of which is reported to be from 3 ft. 6 in. to 4 ft. in thickness, and another about 3 ft. 6 in. at the outcrop. Though large sum have been expended in boring for coal at Cape Paterson, no useful results have been obtained. The evidence collected up to the present time is so conflicting, and in its character so different from that kind of evidence which a practical man would gather, that while on the one hand it prevents capitalists from risking their money in any sustained attempts to open the mines, it encourages on the other the belief that coal could be wrought and shipped to Melbourne, if only fair opportunities were given to the miner. The areas occupied by the coal-bearing rocks, which extend from Bellarine to Cape Otway, should also be surveyed, and the extent and value of the outcropping seams determined. From the copper mines of Gippsland good samples of ore have been taken from a vein which is reported to be in some places more than 30 ft. in thickness, and it is highly improbable that this is the only vein in the district. In conclusion, he proposes to maintain one party in the field, and provide for the regular publication of maps, reports, analyses of minerals, &c., which would not cost more than 1500*l*. per annum, and he would rely upon the exertions of private individuals for the rest. Many of these, in reply to but one application since the Geological Department was abolished, have furnished a large amount of useful work willingly and gratuitously, and he observes that they should not grudge a reasonable sum for the further examination of the territory whose prosperity commenced with, and has been continued by, the exploration of the metalliferous and mineral deposits with which it abounds.

FOREIGN MINING AND METALLURGY.

We have little fresh to report as regards the Belgian iron trade. The works are pretty well employed, but the orders received for Belgian rails are almost *nil*. In this branch of Belgian industry, more than in any other, peace is ardently desired, as it would involve an immediate revival in affairs, and would be a very considerable compensation for the trials and difficulties which industrials have had to endure. A contract has been let by the Dutch Minister of the Interior for the delivery of 3000 tons of rails with fish-plates, required for the Dutch State Railways in 1871. The lowest tender was at the rate of 6*l*. 19s. per ton, and the contract was let to Messrs. Bolckow, Vaughan, and Co., of Middlesborough. Messrs. Hopkins, Gilkes, and Co., the Ebbw Vale Company, and Messrs. Joseph Whitham and Son, of Leeds, also tendered at somewhat higher rates, as did MM. de Dorlodot, the well known Belgian firm.

The capitulation of Paris is expected to give a decided impetus to the demand for Belgian coal. Not only will there be an active enquiry on Parisian account, but the East of France and the Moselle, where industrial establishments have suffered less than had been expected, will also be eager to lay in supplies. The Lille Chamber of Commerce has come to the conclusion that it is advisable to suppress all duties on foreign coal imported into France.

The central section of the Belgian Chamber of Representatives has adopted unanimously a proposed credit of 260,000*l*. for the Department of Public Works, to enable it to provide railway plant. Should it appear necessary to make a further provision of rolling-stock the Government will not hesitate to solicit additional credits. A report of M. d'Audrimont shows that the quantity of Belgian railway plant detained in Germany amounted at the close of December, 1870, to 2237 trucks, and in France—as well in invaded districts as in uninvaded districts—to 1581 trucks, making an aggregate of 3818 trucks. The question begins to be discussed—What is the state of all this stock, and in what condition will it be returned to Belgium? The Germans are using it to transport provisions and munitions of war into France, and they have scarcely time to take much care of it, or to carry out needful repairs. Exposed to all the risks of war, not properly attended to by either of the belligerents, it is thus apprehended that a large part of the Belgian rolling-stock now out of the country will return in a very indifferent state, and even such as may come back in a serviceable condition will not re-enter Belgium until long after the cessation of hostilities. It is urged by some that by way of compensation the administration of the Belgian State lines had at its disposal 3060 trucks belonging to the Northern of France and the Eastern of France Railways, besides 256 German trucks; but now that Paris is being re-victualled, and now that communications are re-established with France, all these French and German trucks will probably return to France with loads of coal, iron-castings, &c., while it is well nigh certain that the great bulk of the French trucks will not find their way back again.

The administration of the Belgian State lines professes a certain confidence that it will be able, with the aid of the new rolling-stock now ordered, to fully meet the requirements of the Belgian coal trade and the Belgian public generally. This opinion is far from being shared, however, by the Charleroi Coalowners' Committee. The Charleroi coalowners contend that their industry and Belgian interests generally require 1000 new trucks (of which 800 should be devoted to coal), 4000 trucks more for coal alone, and 50 new locomotives, instead of 30, proposed to be ordered. This demand of the Belgian coalowners is, perhaps, exaggerated, and probably they ask for more in order to obtain something. Possibly the Belgian Government and Legislature may yet, however, meet their views to some extent.

There has been no noticeable variation in copper at Marseilles

The German copper markets also present few features of interest; purchases are only made to meet the immediate requirements of consumption, but prices are sustained pretty well. As regards tin, the amount of business doing has been small; at the same time, the tendency is, perhaps, a little better than hitherto, although there is an impression that prices will give way in consequence of the comparative weakness of the English and Dutch markets. The Rotterdam market has been rather more quiet, and Banca has declined to 77 fls. Billiton, which is scarce, is held at high rates. The stock of Banca and Billiton tin in Holland at the close of January was returned at 161,468 ingots, as compared with 131,077 ingots at the close of January, There is no change to report in the European lead markets. The Breslau zinc market has been quiet since the conclusion of important transactions which took place in January. In consequence of continuous arrivals the stock of zinc at Breslau has regained its old level. At Hamburg the transactions which have taken place in zinc have been scarcely worth mentioning.

The announcement that the French Republican Government intend to withdraw provisionally from the treaty of commerce with England has created some alarm in mercantile circles, but it will, doubtless, be received with delight in Coventry and Macclesfield. A French Commission of Inquiry into the operation of the commercial treaty between England and France sat last year, and examined both English and French witnesses. It will also be recollected that the Chancellor of the Exchequer stated to a deputation that waited upon him last February that he was not in favour of commercial treaties. It is, therefore, possible that our Government would see without dismay the withdrawal of France from the Treaty of Commerce of 1860, which would leave England free to negociate for the reduction of various duties, and enable our Government, if so advised, to impose an export duty upon English coal. By the Treaty of 1860 England engaged not to place an export duty upon the shipment of coals to France for a period of ten years. Under this treaty manufacturing interests have grown up in France, which render cheap coal absolutely necessary. France will lose a portion of her coal fields by the proposed cession of her territory, and thus our Government may have in coal a lever which may usefully be applied to the reduction of duties on English manufactures imported into France. The news will remind our free traders of the courage and wisdom shown by Napoleon III. in negociating the treaty, which has been so favourable to the peace, prosperity, and social progress of both countries. The ex-Emperor was in advance of public opinion in France on free trade subjects, and it may be that a more popular Government may adopt a reactionary protective policy, which, if it gratifies the English silk trade, may injure our shipping interest and various branches of commerce which have grown up under the treaty of 1860.—[The Paris Government has rejected the proposal of M. Dorian for terminating the treaty of commerce with England; it will, therefore, remain in force a year longer.]

FOREIGN MINES.

EXCHEQUER (Gold and Silver).—Jan. 9: Five feet were made in the upper tunnel last week, and a cross-cut from the face east 9 ft.; the ledge here is 12 ft. wide between the casings, and looks favourable. The winze shift recommenced sinking from the 80; they also put in one set of winze and three sets of tunnel timbers. You will be glad to hear that this shift has again struck rich ruby ore, some of which I brought up with me, will assay to-morrow, and will communicate result in my annual report, which I am now writing. The shift in the 50 made 4 ft. of east drift and 2 ft. in the main drift.

ANGLO-ARGENTINE.—Report for November: Mr. P. Morrison, in his letter dated Dec. 15, says that notwithstanding a great falling off in attendance, occasioned by the harvest, fair progress above and below ground has been made. At section Chairman, the new adit level recently commenced at the line of drainage is well advanced, and will now be complete by the time we are ready for stamping. Above this, at the point of junction of two east and west lodes with the main, another opening is being made, so as to attack the large mass of ore left by the natives, and to which he attaches great importance, as, in all the trials, higher produce has been met with than in any other place. The other points on the south sections remain unchanged. At the North Mine the large open cut will also be finished in time, giving an inexhaustible supply at a minimum of cost for some time to come. The working is on an immense scale, admitting of large carts, and eventually of tram-wagons, up to the point of attack, from which alone he will be able to supply the stamps. Desmontes are likewise being collected, having already sampled 1000 tons, and a similar amount at the south section; in fact, the general aspect of the mines could not be more favourable. The machinery is nearly all placed, and he is now looking forward to raise steam at the very latest in March. The masons are busily engaged in making reservoirs, stamps, foundations, and the temporary arrastres, from which some returns may be looked for during the erection of the permanent machinery for reduction.

VAL ANTIGORIA (Gold).—Thomas Roberts, Feb. 2: We consigned this morning to Signor Carlo Menozzi one ingot of gold, weighing 946 grammes, equal to 30 ozs. 8 dwts. 11 grs. obtained in the month of January from 42 tons of ore. The incline shaft is now down to the 30; during the present month we intend making the sink for water in bottom of this level, and next month we shall be able to drive the 30 end south with a full pare. In the past month we drove the 20 end south on No. 2 lode, and are pleased to say we have drained the water that bothered us last month in the south end of the ground above the 20 down to the 20 fm. level; this month we shall be able to commence a new stope in back of the 20, south of winze, as we calculated to do, where the lode will yield 2 tons of ore per fm. The stope in back of this level, north of winze, is poor. The stope in back of the 10, on this lode, yields 2 tons of ore per fm. The stope in back of the 10, on No. 1 lode, north of main shaft, yields 1½ ton per fathom. The stope in back of the 20, south of winze, is poor, and suspended. We have resumed an old stope in back of the 20, south of main shaft, the lode giving 2½ tons of ore at present per fathom.

PESTARENA UNITED (Gold).—Thos. Roberts, John Mitchell, Jas. Roberts, Feb. 2: We consigned this morning to Sig. Carlo Menozzi three ingots of gold, of the weight of 7009 grammes, equal to 225 ozs. 7 dwts. 5 grs.; and on the 16th four ingots, that weighed 5107 grammes, or 164 ozs. 5 dwts. 14 grs., making a total for the month of January of 12,116 grammes, equal to 389 ozs. 12 dwts. 19 grs. This gold was produced from 639 tons of ore, of which 86½ tons were amalgamated at Pestarena by the small mills, and gave 103 ozs. 1 dwt. 11 grs.: 127 tons of ore from Pestarena, amalgamated at the Battigio establishment, gave 62 ozs. 15 dwts. 12 grs., and 425½ tons at Val Toppa establishment gave 223 ozs. 15 dwts. 20 grs. Owing to the continual falls of snow in the past month the men have only been able to sledge a very small quantity of ore from the Val Toppa Mine. For this reason we were obliged to treat the inferior ore that is being brought down by the wire tramway on their experimental trials. Yesterday we finished clearing once more the snow from the slead road, and hope to-day to be able to resume sledging ore to the cart road.—Mine: The end driving north from third cross-cut, on the new lode, is yielding 8 tons per fathom, worth ½ oz. of gold per ton, and the rise in back of this level the same value. The winze in bottom 12 tons, at 1 oz. per ton. The ends driving north and south from the fourth cross-cut are producing stones of ore. No. 1 stopes, on the new lode, yield 10 tons, at 15 dwts. per ton; No. 2 stopes 10 tons, at 1 oz. per ton; No. 3 stopes 7 tons, at ½ oz. per ton. The stopes in bottom, north and south of winze from second cross-cut, are each producing 12 tons per fathom, worth 1 oz. per ton. The end driving north from cross-cut, on the western part of the quartz lode, is producing 8 tons per fathom, at ½ oz. per ton: 55 metres north of this cross-cut, at the junction of the east and western parts of this lode, we have commenced to drive south on the western part; lode producing 10 tons per fathom, at 8 dwts. per ton. We have reached the wall of the western part of the lode in a cross-cut above No. 2 level, but have not as yet cut through it.—No. 3 Level: The end driving north from second cross-cut west is producing 8 tons per fm., worth 7 dwts. per ton; and the end south 6 tons, at 6 dwts. per ton. No change in the cross-cut west. The cross-cut east is letting out plenty of water. Rise in side lode poor. The rise on this lode, in back of No. 4 level, yielding 2 tons, worth 8 dwts. per ton. The lode in the end driving south, in No. 5 level, is large, but hard and poor.—Peschiera Mine: The stopes in back of the 16 yield 7 tons of ore per fathom, at 17 dwts. per ton. The 33 end, driving north on No. 2 lode, is producing stones of ore. The stopes in the back, behind this end, yield 4½ tons per fathom, at 1½ oz. per ton. The 33 end north, on No. 5 lode, yields 3½ tons per fathom, at 15 dwts. per ton. The winze under the 46 is communicated to the intermediate level, where the lode will yield 5 tons per fathom, at 18 dwts. per ton. The 65 end, driving north on No. 2 lode, yields 2 tons per fathom, at 18 dwts. per ton. The stopes in bottom of the 75 yield 10 tons per fathom, at 1 oz. 3 dwts. per ton.—Acquavite Mine: The 23 end south is poor at present. The stopes in bottom of the 23, south of winze, yield 8 tons per fathom, worth 15 dwts. per ton. The 23 end north yields 3 tons per fathom, at 7 dwts. per ton. The stopes in the bottom, behind this end, 7 tons per fathom, worth 14 dwts. per ton. The 33 end south yields 5 tons per fathom, at 8 dwts. per ton. The 46 end south yields 3 tons per fathom, at 1 oz. per ton. No. 1 stope, in back of the 46, yields 5 tons, at 1½ oz. per ton; and No. 2 stopes, in back of this level, 7 tons, at 1 oz. per ton. The 55 end, driving north, yields 5 tons, at 15 dwts. per ton; and the end south 4 tons, at 15 dwts. per ton. The opening of the whim-shaft under the 23 is progressing favourably. The water in the Anza continues to be low; 100 small mills only working.

LINARES.—Jan. 18: Pozo Ancho: The lode in the 85, west of Warne's engine-shaft, is large, containing a few spots of lead, but nothing to value. In the 75, west of Crosby's shaft, the lode is small and poor. The 65, west of San Francisco shaft, is opening up good tribute ground, worth 2 tons per fm. In the 55, west of San Francisco, the lode is very regular, containing a small branch of lead ore, yielding ¾ ton per fathom. In the 45 west the lode is small, consisting of quartz and lead ore, and yielding 1 ton per fathom. There is nothing to value in the 25 east of the above shaft.—Shaft and Winzes: Good progress is being made in San Francisco shaft sinking below the 65. The lode in No. 174 winze yields 2 tons per fathom, and is compact and solide, and looking very kindly.—Los Quinientos: The lode in the end of the 55, east of Taylor's engine-shaft, continues large, but is still unproductive. In the same level west no improvement has taken place to notice. The lode is small and poor in the 45, west of this shaft. In the 45, east of Addis's, the lode is split up into branches. The upper part of the 32, driving east of Addis's shaft, is now in old works; the lode here yields 1½ ton per fathom. At the 45 cross-cut, south of Cox's shaft, we have intersected a branch, but the main part of the lode is still before us. The lode in the 32, west of Henty's shaft, is large, yielding good stones of ore. The lode in the 32, east of this shaft, has fallen off a little in value since our last report, and now yields 1 ton per fathom. In the 45, east of San Carlos, the lode is quite poor at present. The lode is yielding a little lead in the 45 west, but not enough to value. There is no change to notice in the 32 west, of the same shaft. In the eastern end of this level the lode is large, of a kindly appearance, and yielding 1½ ton per fathom.—Shafts and Winze: Taylor's engine-shaft is being sunk below the 55 at a satisfactory rate. The men at San Carlos engine-shaft are making preparations for fixing a lift at the 45. The lode is looking well in Castellano's winze, under the 45, and yielding 2 tons per fathom. Gilez' winze is going down in a productive lode, giving 1½ ton per fathom.

FORTUNA.—Jan. 18: Canada Incosa: In the 120 fm. level, driving west of O'Shea's shaft, the lode is strong and well defined, with good stones of ore, giving ½ ton of lead ore per fathom. There is no improvement worthy of notice in the lode in the same level driving east of O'Shea's shaft; the lode yields ½ ton of ore per fathom. The men are making moderate progress in the 110 fm. level, driving west of O'Shea's shaft; it is a hard cross-cut. In this level, driving east of the same shaft, the lode is split into several small branches, and produces ¾ ton per fathom. The ground is very hard for driving in the 100 fm. level, west of Henty's shaft, and the lode is rather small at present, yielding ½ ton per fathom. The men are making moderate progress in the cross-cut in the 80 fm. level, driving south of Henty's shaft. The lode in the 50 fm. level, east of San Pedro's shaft, is quite unproductive, in consequence of which the men are put to drive west of the shaft. In the 60 fm. level, driving east and west of Pedro's shaft, the lode is large and strong, and of a promising appearance, consisting chiefly of carbonate of lime, quartz, and good stones of ore, the production being in both ends alike, ¾ ton per fathom. The lode in the 90 fm. level, east of Addis's shaft, is very wide, composed of calcareous spar and lumps of lead ore, of which latter it gives ½ ton per fathom. The 80 fm. level, driving west of Lownde's shaft, is in a regular and moderately good lode, and opens tribute ground, which will be taken away at a good profit, it produces 1 ton of ore per fathom. The eastern end of this level, although not so productive as it was produces 2 tons of ore per fathom, and is laying open a good run of ore ground. Callegon's winze, sinking below the 110 fm. level, is going down in a very promising lode, yielding 1½ ton per fathom. In Aviva's winze, sinking below the 110 fm. level, the lode has a promising appearance; it gives ¾ ton of ore per fathom.—Los Salidos: The lode is firm and regular in the 100 fm. level, driving west of Buenos Amigos shaft; it consists chiefly of carbonate of lime and quartz, and produces 2 tons of lead per fm. In the 90 fm. level, west of Buenos Amigos shaft, the lode is compact and solid, yielding 2 tons of ore per fathom. In the 75 fm. level, driving west of San Carlos shaft, the lode is greatly disarranged, and split into several small branches, yielding ½ ton per fathom. The lode in the end of the 110 fm. level, east of Morris's engine-shaft, is small and poor, and the ground very hard. The 100 fm. level, east of Cox's engine-shaft, is passing through a run of ore ground of great value, and gives 3½ tons of lead ore per fathom. In the 90 fm. level, driving east of San Pablos shaft, the lode was easy for driving through in the past month, during which great progress was made; 3 tons of lead ore are extracted per fathom. The lode in the 25 fm. level, driving east of Palgrave's shaft, changed unfavourably the other day, but has again reached its former rate of production—2 tons per fathom. In the western end of this level the lode is small and split into branches. The men are getting on very well with the Buenos Amigos engine shaft, sinking below the 100 fm. level, and extract ½ ton of lead ore per fathom. Very little has been done during the past month in Castelar's winze, sinking below the 65 fm. level; it produces ½ ton of ore per fathom. We expect to hole Simon's winze to the 100 fm. level in the present month; it is giving 1½ ton of ore per fathom. In Jurado's winze, sinking below the 100 fm. level, the lode is small and poor, and hard for sinking through. In San Carlos shaft, sinking below the 75 fm. level, the lode dips north fast, and remains standing in that side of the shaft. The tribute department yielded a good rate of raisings in the past month, and many of the stopes are moderately productive at present. We estimate the returns at 350 tons for January. The machinery is in good working order.

[For remainder of Foreign Mines see to-day's Journal.]

Hudson River Copper Company,

NEW YORK, UNITED STATES,

SULPHUR, COPPER, AND NICKEL MINES.

Incorporated Nov. 11, 1864, under the General Act of Feb. 17, 1848, and Amendment Acts passed since.

The shares are all fully paid.

The Capital is 1,500,000 Dollars (say £300,000) in 60,000 Shares of 25 Dollars (say £5 each).

THE TRUSTEES AND DIRECTORS ARE—
WILLIAM KEMEYS, New York—PRESIDENT.
ALFRED F. KEMP, Staten Island—TREASURER.
WM. N. ARMSTRONG, New York.
GEORGE M. WHEELER (of W. Bailey, Lang, and Co.), Westchester County.
EDWARD KEMEYS, New York.

SECRETARY—THEODORE CLARKSON, Brooklyn.

OFFICES,—29, WILLIAM STREET, NEW YORK.

BROKERS—LOUNSBERY AND FANSHAWE, 8, Wall-street, New York.
COATES AND HANKEY, 24, Gresham-street, London.

AGENTS IN LONDON—CHILD, HORNBY, AND CO., 27, Lombard-street, London.

COUNSEL AND SOLICITORS—Mr. JOHN L. SUTHERLAND, New York.
Messrs. KIMBER AND ELLIS, 79, Lombard-street, London.

The mine of this company is situated at St. Anthony's Nose, on the Hudson River, about forty-five miles from the city of New York. It is within easy access from the city by railway, river, and road. The property lies in the township of Cortlandt, Westchester county, and the township of Phillistown, Putnam county, both in the State of New York, and can be readily seen by reference to the map. The present workings of the property are on 52 acres (freehold), which lie in Putnam county. Besides this, the company have in the same county a 15-years lease of 250 acres of land adjoining the 52 acres. There are 80 acres in Westchester county, which the company have the right to purchase for $15,000 at any time before Nov. 23, 1872, on which property also they hold a lease for 15 years still to run. The company are paying for this lease $1500 for this year (1870), and will pay $2000 for 1871, and $2500 for 1872 and subsequent years until the end of the lease, unless previously purchased, which it is the intention of the company to do. These lands cover everything known of the mine, and are in length about one mile. The river frontage of the property is 600 ft. in length, and is within 100 ft. of the channel of the river, where the company's new dock is being built, and is nearly completed, alongside which a vessel of 3000 tons can load.

CONTENTS OF THE MINE.—The mine now opened is found, as was anticipated, to be a solid mass of pyrites, consisting chiefly of sulphuret of iron and sulphuret of copper. Some nickel has been found in samples of the former assaying ½ per cent. to 6 per cent. If this should prove continuous, it will of itself be extremely valuable and profitable in addition to the sulphur and copper. These ores are mixed with quantities of hornblende, apatite, or phospate of lime and felspar. As a source of immediate profit, the sulphur ore only, which the mine furnishes in great abundance, is being worked and sold at a profit of about $2½ per ton, while the rich copper ore is laid aside for the present, and stored to be dealt with hereafter.

WORK DONE.—Since the formation of the company, six years ago, they have had great difficulties to overcome in the dead work at the mine, and in opening up a market for the sulphur ore among the chemical manufactures, both of which have now been accomplished. This period has been occupied in the construction and perfecting of the mine shaft, with connected level, tracks, cars, tramway, &c., besides getting considerable quantities of ore mined out and ready for delivery. The lower tunnel or adit level running into the vein is 300 ft. long, and the shaft is 180 ft. deep. Not having been run to exactly meet, the two have been connected by large stopes in the vein. Splendid ventilation has been thereby secured. Being from 700 to 900 ft. above the natural drainage of the country, the mine is insured against any serious trouble from water, and no pumping is required. All the water now entering the mine comes from the surface.

PRESENT CONDITION.—The directors are taking steps to procure the speedy completion of the new dock at the termination of the new road just finished, by which a saving of 50c. per ton or more will be effected in the transportation of the ore to the ships. The new road is a continuous inclined plane of about one mile. The road heretofore used is circuitous to the extent of about three miles, and has some up grades. The company has a market already for its sulphur ore at $5 per ton. It has the additional advantage of a customer in the immediate neighbourhood, in a firm which has erected large vitriol (sulphuric acid) works alongside the company's new docks. It is found that the ore makes as high a quality of vitriol as the Sicilian sulphur, and burns well. The manufacturers are learning to roast the ore now to such perfection as to extract all the sulphur to within a small percentage. The directors believe they have one of the best mining captains in the country. He has had many years' experience in England, and more particularly for the last ten years, in the State of Vermont, where he has managed a mine of similar character with great success. His name is Thomas Pollard. There are considerable quantities of sulphur and copper ores already mined out and lying ready for sorting and delivery. Last year the company worked out (besides getting through the dead work) about 5000 tons of sulphur ore, and sold the same for about $25,000 (say, £5000), which must be considered a fair beginning.

The accommodation and buildings at the mine consist of the house at the mine, where the men are boarded, which is 40 ft. long, 20 ft. wide, and two stories high, lined with bricks, with an addition, 20 by 15 ft., one story high, used as a wash-house. A large earth cellar, near the house, for keeping meats, vegetables, &c. (The house has had as many as forty men in it, and is well built, and comfortable.) The superintendent's house, two stories high, a very good house, new, and in all respects convenient and suitable for the purpose. A stable, with room for six horses, harness, &c. A new thoroughly-built blacksmiths' shop alongside the trock at the mouth of the adit level. An office by the side of the scales where the ore is weighed. A changing-house, where the men change their working clothes for clean ones, and a substantial shed over the dump and sorting-ground. A few small houses, costing $500 each, would be very desirable as residences for married miners who have families, the boys working well as sorters of ore, and in many other ways being as useful as men, and much less expensive. The question of their erection is now under consideration. Many of the men find board with the surrounding farmers' families, and prefer living in that way. The workings are well planned and shaped. The rock stands, without timber or masonry, as firm to-day as it did three years ago.

COST, VALUE, AND PROFIT PER TON.—The net profits on the sulphur ore, now sold at $5 per ton, is about $3 per ton, thus:—Contract to miners to deliver the ore on the dump, per ton, 75 cents; sorting, per ton, 25 cents; hauling to dock, per ton, over new road, 50 cents; all incidental expenses, office, superintendent, &c., 50 cents: total, $2. Sold at the dock, per ton, $5; profit, $3 per ton. The net profit on 6 per cent. copper ore worked on the spot for metal only is estimated at $14 per ton. Many of these expenses are taken too high, and will not be materially increased whatever quantity of ore be taken out in a given time. The improvements now going on will still further reduce expenses. It must not be supposed that $5 per ton is the highest price that could be obtained for the sulphur ore. It is put at this low figure at present to encourage the manufacture of sulphuric acid therefrom.

QUANTITY OF ORE.—The mine is, properly speaking, a huge quarry of sulphur ore, actually visible, and open to the inspection of anyone. There is nothing imaginary or speculative about this. It is only as regards copper and nickel that it can be looked upon as a mine, and, therefore, upon this point only to some extent speculative. The directors base their calculations of future earnings and profits upon the actual facts and experience derived from the last six years' working, and more particularly upon that of the past year. These calculations are verified by Prof. Raymond, Mining Engineer to the United States Government, who reports that the mass of solid ore now exposed to view, and ready for breaking down and carting away for sale, amounts to at least 40,000 tons:—In the stope from the cross tunnel to bottom of the shaft (say), 16,000 tons; in the stope from the upper drift down to the large tunnel stope, 10,000 tons; in the ground south of the shaft, 14,000 tons: total, 40,000 tons of sulphur ore, in extracting which some 4000 to 5000 tons can be set aside as 6 per cent copper ore. In the ground south-west of the shaft there are about 46,000 tons more easily to be opened up, without any dead work. There cannot reasonably be any doubt of the continuance of the deposit in depth, and there is at least 700 ft. in perpendicular height yet. Besides the deposit now worked upon there are, doubtless, parallel recurrences in the same zone. Where one rich ore-body thins out another will be found to set in, and this metalliferous series continues in the property for at least a mile, as is indicated by the outcrops traced for that distance. Hence the company can at any time open upon some other outcrop, and double the rate of production. The capacity of the mine is, therefore, practically beyond limit.

ESTIMATE OF PROFITS.—Upon the foregoing moderate calculations, there will be a net profit on the ores now in sight or available without any dead work being needed, as follows:—In tunnel stopes: sulphur ore, 35,000 tons, at $3, profit $105,000 (£21,000); copper ore, 5000 tons, at $14, profit $70,000 (£14,000)—In south-west ground: Sulphur ore, 40,000 tons, at $3, $120,000 (£24,000); copper ore, 6000 tons, at $14, profit $84,000 (£16,800): total, $379,000 (£75,800). It will probably take, with the present force of men, about three years to extract the above, but it depends entirely upon the number of men the company choose, or their finances permit, to be employed. It can be pushed ahead much faster than this. However, calculating at this slow rate, the above would give a return equal to 8½ per cent. per annum on the nominal capital of $1,500,000 (£300,000). The extraordinary shipping advantages of the company, and the great and increasing demand for the ore among acid and vitriol manufacturers, render it safe to look forward to a steady prosperity.

ASSAYS.—The company sent to London some samples of all the ores (selected promiscuously by Mr. Alfred Kimber, C.E., Associate of King's College, London, who visited the mine for the purpose) to be assayed by Mr. Frederick Claudet, of London. These samples, rich and poor together, were analysed and reported upon by him as follows:—No. 1 samples, magnetic pyrites. No. 2 samples, copper pyrites, intermixed with magnetic pyrites. Sulphur, No. 1, 34·45; No. 2, 29·52; iron, No. 1, 51·25; No. 2, 37·56; copper, No. 1, ·83; No. 2, 8·28; nickel and traces of cobalt, No. 1, ·60; No. 2, 46; carbonate of lime, No. 1, 3·50; No. 2, 4·63; insoluble rock, No. 1, 8·40; No. 2, 18·40; moisture, No. 1, ·20; No. 2, ·20; oxygen and loss, No. 1, ·77; No. 2, ·95: total, No. 1, 100·00; No. 2, 100·00. Mr. Alfred Kimber writes that "as a pyrites mine (sulphuret of iron) it is a great success, and the quantity is inexhaustible. The samples sent may be taken as a fair test of the quality as regards the sulphur. From the appearance of the ore now coming out, the future of the mine is very good as regards copper. You cannot find a single piece of ore that does not show copper, and the quantity of rich copper ore seems to be increasing." The company had a lot of 50 tons of ore tested on July 14, 1870, by Prof. Chandler, at the School of Mines, Columbia College, New York, and received his certificate that it contained 7 60-100ths per cent. of copper.

PROSPECTS AS TO COPPER.—The miners are steadily coming to more copper, and all who see it have but one opinion, which is that it is a great copper vein. The numerous heaps of copper ore, more or less concentrated, which lie about the dumps cry aloud to be utilised, but until recently there have been no American purchasers of 3 per cent. to 7 per cent. ores of copper. Professor Raymond, before mentioned, reports that "as the work has progressed it is found that the magnetic sulphuret of iron has become purer and massive, and contains less of hornblende and felspar, while the sulphuret of copper in the stripe found in the hanging wall is richer;" and he "emphatically repeats the opinion that in depth the percentage of copper will increase. It is confirmed by the actual experience of the mine." Mr. Alfred Kimber writes "that he feels more and more convinced every time he goes to see the mine of its great future. The ore is fast approaching that point when it will be difficult to know how to sort it. The copper is more evenly distributed throughout the sulphur, and is increasing to such an extent that it will be difficult to say whether it shall be called sulphur ore, and sold at $5 per ton, or whether it would pay to sort for copper ore at $3 a unit, which for 6 per cent. copper ore at $3 a unit would give $18 per ton. The dead work to be done in the mine is positively nothing, and the ore is coming out so free from rock that it only requires sorting for copper."

The running expenses owing by the company did not exceed $8500 (1700*l.*) on Aug. 31, 1870. The money owing to the company for sulphur ore, sold and delivered, amounted to $9000 (1800*l.*) on the same date. The balance of cash in the hand of the treasurer is $2000 (£400). The company have no debts or incumbrances of any kind, with the exception of a mortgage for $5730 (£1140) remaining on the Putnam County property, which the company are ready to pay off whenever required. The fiscal year of the company ends on the second Monday in October of each year. The annual meeting of stockholders is held at the office on the fourth Monday in October of each year, at twelve o'clock. The principal office of the company is at 22, William-street, in the city of New York, where the books are kept.

A copy of the constitution and bye-laws of the company, and of the laws of the State of New York relating to the same, can be seen at the office of the company, and of Messrs. Kimber and Ellis, solicitors, 70, Lombard-street, London, by whom shares will be received and forwarded, when required, for registration. The shares are transferable by simple endorsement of the share certificates, and the holder can have his own name registered in the company's books when he pleases, on production of the certificates so endorsed.—W. KEMEYS, President; ALFRED F. KEMP, Treasurer; T. CLARKSON, Secretary.

[All the figures have been reckoned at $5 to the £1 on both sides, for convenience of calculation by English shareholders.]

A FEW SHARES IN THIS COMPANY REMAINING UNSOLD ARE TO BE OBTAINED AT £2 PER FULL PAID SHARE, ON APPLICATION TO THE BROKERS.

MINING IN CALIFORNIA.—The quartz mining interests in Tuolumne county seem to be looking up again. The Grizzly Mine yielded largely from the surface down a short distance. It changed hands several times. An English company spent large sums without success. Last fall work was again commenced by the same company, under intelligent management, and has resulted in the development of rich ore, and the mine now has every prospect of being successful. The Knox and Boyle Mine, from bad management, was run into debt and sold at forced sale. The purchasers have worked only for the purpose of ascertaining the value. Tunnels and shofts have been run until it has developed a mine of great richness. The App Mine was sold two years ago to parties in the East. For some months sinking of shafts and driving of drifts have been going on, which result in showing large bodies of fine ores. Ore from the Heslep Mine has been continuously worked at a small profit for years. Within a few weeks a body of extreme rich ore has been reached, which, when opened, will produce largely. A few days ago some parties discovered a rich vein near Yankee Hill. The Confidence Mine has been worked a year, and has made satisfactory returns, much of the time yielding largely. In this mine there is paying ore enough in sight, and some of it very rich, to require machinery for crushing for several years to come. Never until the present management could it be made to pay.—*Sonora Democrat.*

LONDON GENERAL OMNIBUS COMPANY.—The traffic receipts for the week ending Feb. 5 were 8405*l.* 12s. 9d.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*February* 11, 1871.